DOCUMENT RESUME

ED 194 261 RC 012 328

TITLE Guidelines for Outdoor Education.
INSTITUTION Leeds and Grenville County Board of Education, Brockville (Ontario).
PUB DATE Nov 70
NOTE 140p.; Colored background may not reproduce well.

EDRS PRICE MF01/PC06 Plus Postage.
DESCRIPTORS *Educational Objectives; *Elementary Secondary Education; Environmental Education; *Experiential Learning; Instructional Materials; Interpersonal Competence; *Learning Activities; Lesson Plans; *Outdoor Education; *Resource Units; Self Esteem; Skill Development
IDENTIFIERS Ontario

ABSTRACT

The outdoor education program detailed in this document is envisaged as permeating the total elementary/secondary curriculum to study natural topics in natural settings and to promote respect for and appreciation of the natural environment, perception of total environment as a learning area, perception of the interrelationship of all living things, awareness of the wise use of the environment for recreation, awareness of the need for conservation in all aspects of the out-of-doors, and development of the child's ability to enjoy himself thoroughly and to function efficiently in a democratic society. To achieve the above goals, stress is placed on the development of skills rather than on content-oriented curriculum and both school and community environment are included in the activities. Suggested divisions of outdoor subject matter and some alternatives for beginning studies in each area are outlined. The material is suggested for use as a starting point only, for the teacher's professional knowledge and experience with students, along with imagination, will make possible the integration of other activities into the outdoor program. Activities are repeated at several levels so that the maturing student may investigate the area in greater depth in keeping with increasing levels of competence. Specific topics addressed include school, transportation, hills, old cemeteries, wooded areas, pond and stream, grassy areas, marshy areas, rocks and minerals, atmosphere, community helpers, map and compass, farm study, urban study, and "outers". (Author/AN)

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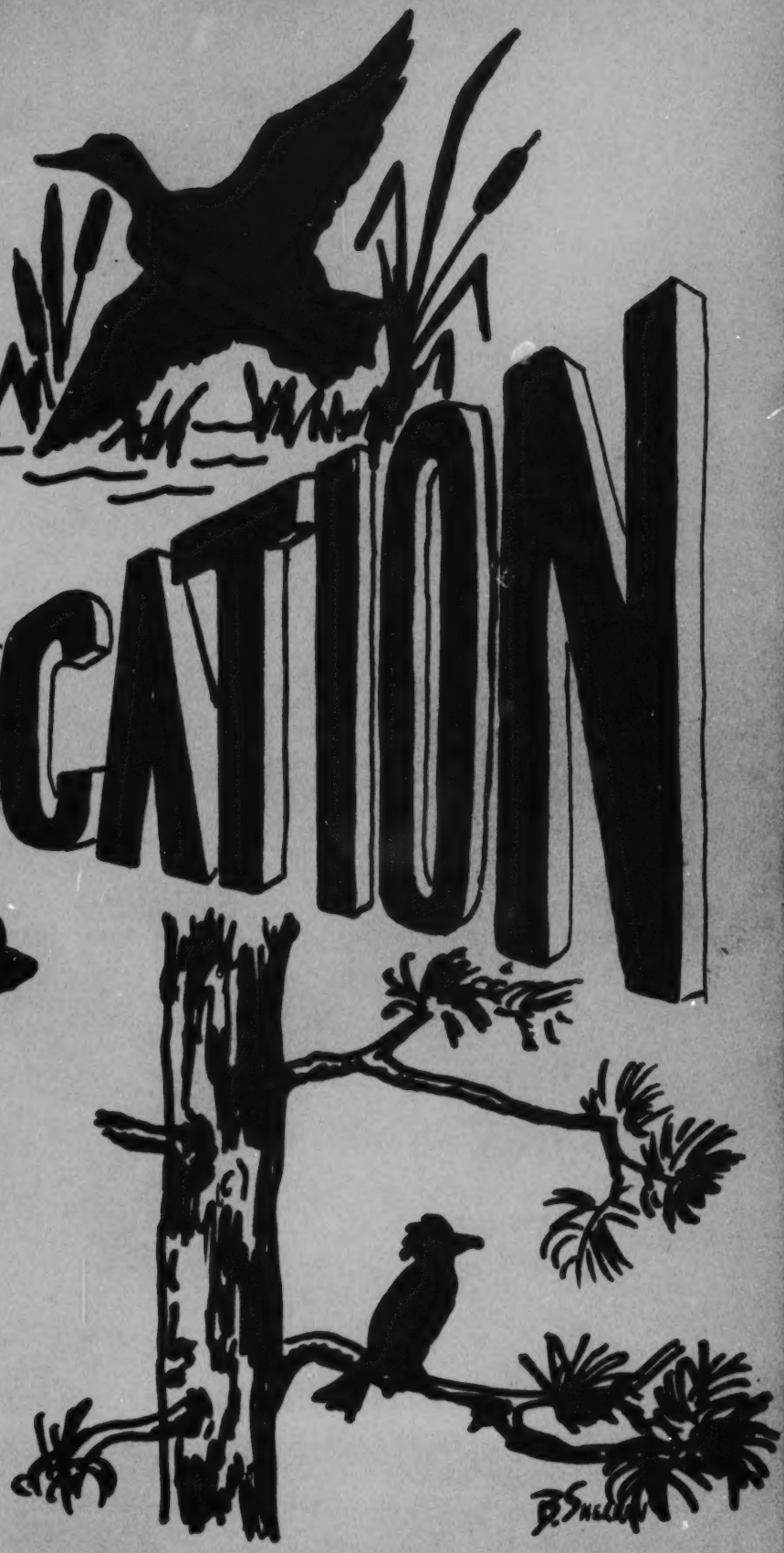

RC 012 328

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THE LEEDS & GRENVILLE COUNTY BOARD OF EDUCATION

GUIDELINES

FOR

OUTDOOR EDUCATION

Prepared by
Committee on Outdoor Education

NOVEMBER 1970

VACATION

I have shut my books and hidden my slate
And tossed my satchel across the gate.
My school is out for a summer of rest,
And now for the schoolroom I love the best!

My schoolroom lies on the meadow wide,
Where under the clover the sunbeams hide.
Where the long vines cling to the mossy bars
And the daisies twinkle like fallen stars.

My lessons are written in clouds and trees,
And no one whispers except the breeze,
That something blows -- from a secret place --
A stray, sweet blossom against my face.

My teacher is patient and never yet
A lesson of hers did I once forget,
For wonderful lore do her lips impart,
And all her lessons are learned by heart.

Oh come! Oh come! Or we shall be late,
And Autumn will fasten the golden gate.
Of all the schoolrooms east or west,
The School of Nature I love the best.

by Katherine Lee Bates

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I COMMITTEE MEMBERS

Neil Scott, Chairman	Rideau Vista Elementary School
Mrs. Heather Knack, Recording Secretary	Prince of Wales/Brock P.S.
Mrs. Ruth Pedherney	Rideau District High School
Mr. John Johnson	South Grenville District High School
Mr. Frank Forster	North Grenville District High School
Mr. J. Morrison	Addison Public School
Mr. Bill Tolton	Brockville Collegiate Institute
Mr. Bruce Sherman	Westminster/Windsor P.S.
Mr. Cyril Holmes	Commonwealth Public School
Mr. Dennis Arrowsmith	St. Joseph's S.S.
Dr. George Hunter	Co-ordinator, Pure & Applied Science
T.R. Leger	Superintendent of Education

II RATIONALE

Outdoor education is envisaged by the committee as permeating the total K to 13 curriculum to the end that natural topics can be studied in their natural settings by all students.

The committee encourages teachers to integrate as many outdoor educational experiences as possible into the Learning Program.

The committee sees the Outdoor Education Program as fostering the following:

i) respect for and appreciation of the natural environment

ii) seeing the total environment as a learning area

iii) perception of the inter-relationship of all living things - plant and animal

iv) awareness of the wise use of the environment for recreational activities

v) conception of the need for conservation in all aspects of the out-of-doors

vi) the development of the child's ability to enjoy himself thoroughly and to function efficiently in our democratic society

Areas for Outdoor Education activities include both school and community environments.

Stress must be placed on the development of skills rather than content-oriented curriculum to achieve these goals.

III PREAMBLE

In the past we have attempted to develop skills of communication and inquiry, methods of problem solving, and personal growth in ever increasing artificial situations. We have saturated the educational environment with film, T.V. programs, displays, and printed materials and hopefully expect that knowledge thus acquired will be transferred to various out-of-school everyday life situations. Often this transfer did not take place.

Just beyond the classroom lies a different world-the out-of-doors. Children often live in it, and accept it as part of their everyday life without realizing its importance to their form of life and style of living. As a classroom it is free and readily available, yet how often do we take advantage of this natural stimulant of the student's sense of curiosity and wonder to provide worth-while learning experiences?

Outdoor education is not new. For the most part, mankind has tended to forget his relationship with his environment. With the ever-growing amount of leisure time, and the increasing need for conservation and reclamation of resources, the need for experiences of this type becomes more pressing. Every child has a right to enjoy, or learn to enjoy, the beauty and rich variety of natural settings of which he is a part. Educators have realized the importance of exposing students to the natural environment, and we, as teachers, have the privilege of opening young eyes to the structural diversity of the planet on which we live. This is commonly called outdoor education, the development of which is advocated by "Living and Learning", as providing an understanding of the way man and his environment shape one another and will hopefully be a life-time guide.

In the out-of-doors, learning becomes a natural, enjoyable, extension of the youthful, growing, individual. The student can let his imagination ride the wind, see the world in a blade of grass, a crumbling rock, a wandering stream or a bird's morning song.

How reassuring it must be to have the whole area around, and within reach of the school for a classroom. Whether it be a study of colours, simple categorization of materials, or subject matter for a language experience, nature provides abundantly in urban and rural Leeds and Grenville.

That few people appreciate nature is evident in the lack of concern for the damage inflicted on the trees, shrubs, flowers, lawns, building, and equipment in our public parks. A proper appreciation of our environment should help to foster better attitudes of conservation.

The Outdoor Program can

Introduce
Motivate
Consolidate
Review
Apply
Develop
Generate
Stimulate
Integrate
Etc.

What it actually does is up to you.

IV INTRODUCTION

Outlined on the following pages are some suggested divisions of outdoor subject matter and some alternatives for beginning studies in each area. This material is suggested for use as a starting point only.

Your professional knowledge, experience with students, sprinkled liberally with imagination will, no doubt, enable you to integrate interesting, involving, outdoor experiences into your program.

As much as possible the work should follow the interests of the students. They appear to work best at self-appointed tasks and the teacher's role is to develop thought-provoking situations. Questions will arise from the spontaneous student-teacher discussions, and may lead into other areas of investigation. As many senses as possible should be used. The development from each starting point can be expected to be different for each class or group.

Since students do not see the world around them in terms of subjects, it follows that an interdisciplinary approach is preferred with integrated programs being provided by a natural fusion of several subject areas. This should provide a breadth and multiplicity of practical experiences that make learning meaningful and enjoyable. We hope that this approach will prove most rewarding, but it is realized that, on occasion, the teacher will be required to organize and assign specific tasks.

Many of the activities suggested are repeated at several levels so that, as the student matures, he may investigate the area in greater depth in keeping with increasing levels of competence.

As teachers, you will know how compentent your students are, and you will, therefore, be able to guide and challenge them as much as possible.

To start, just take your class outdoors for a short walk. Ask them to identify a variety of sounds and other sensory experiences. Don't be alarmed if they are noisy, or impetuous, or over-excited. This is a new experience for them, as it may be for you. Customarily, after the second or third trip in the out-of-doors much of the novelty of the experience will wear off, and you will be able to settle into a productive pattern of more structured study, in a classroom that is as big as you want it to be.

It is to be hoped that teachers of all grades will take their classes out-of-doors on several occasions throughout the school year. The duration of the activities may range from a few minutes, to several hours, to several days, depending on the nature of the activities, the skills required and the interests of the students and teacher. Your school-yard may provide the experiences required, or trips further afield may serve your purpose better.

The final section contains a number of areas for student investigation. Most comprise a flow chart followed by a number of tried and tested activities and information on suitable locations or community resources. These are in no way complete but are only meant to provide starting points for learning in the out-of-doors.

Activities other than those in these guidelines that teachers find interesting and beneficial to the learning process should be shared with others. This may be done through the Leeds and Grenville County Board Co-ordinators, or any member of the Outdoor Education Committee.

V TEACHER PRE–PLANNING

Most trips or activities will require pre-planning. In the case of a visit to an establishment or a private property, permission would be required.

Student behaviour, lunches, clothing, equipment, parental notification, wash-room facilities, and administrative authorization should be attended to ahead of time, when applicable.

Teachers should be familiar with the facilities available and the activities possible in the particular area of choice. (For further details see Leeds and Grenville Field Trip Committee Report)

On occasion large-group instruction may be found useful, but normally better results will be obtained by the small-group project, or individual student investigations approach.

Time should be allowed for recreation and activities of interest to students.

FOLLOW–UP

Maximum benefit will be derived from the outdoor education experience when follow-up is immediate and adequate.

Frequently the actual time in the field is all to brief and students must be given ample time to follow up their experiences meaningfully on their return.

This follow-up provides an opportunity for subject integration. Students should be allowed to share their findings with others in the group, and this may be done in a variety of ways, i.e. charts, graphs, language experiences, communications media, arts or crafts, etc.

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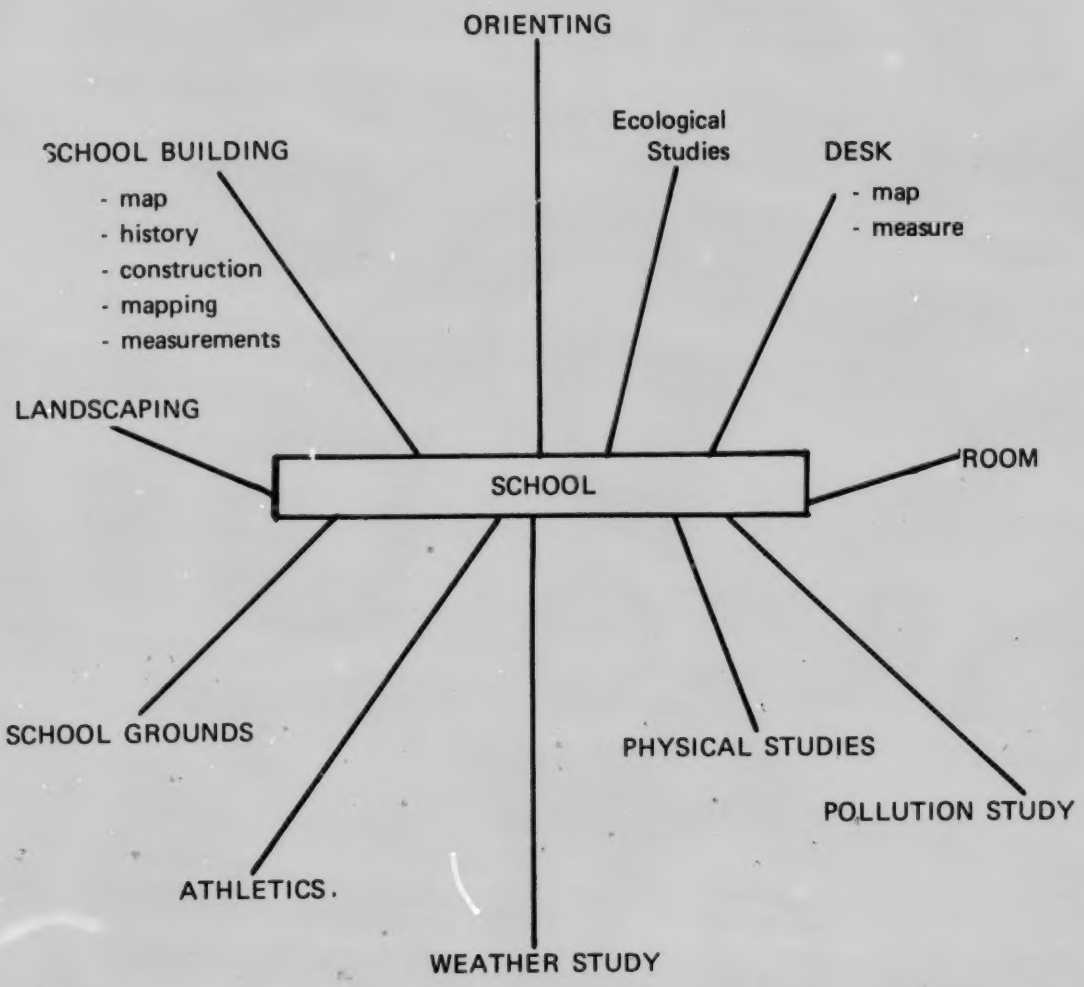
VI TOPICS


ORIENTING
Ecological Studies
SCHOOL BUILDING
- map
- history
- construction
- mapping
- measurements
DESK
- map
- measure
LANDSCAPING
SCHOOL
ROOM
SCHOOL GROUNDS
PHYSICAL STUDIES
POLLUTION STUDY
ATHLETICS
WEATHER STUDY

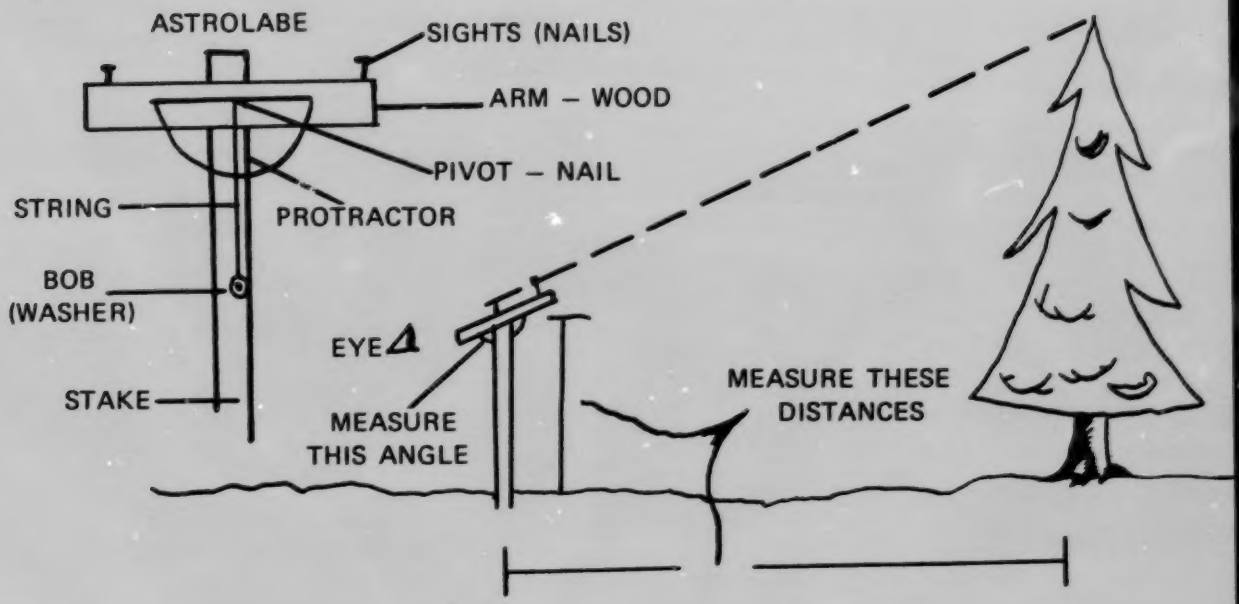
Some Suggested Pupil Activities

A. Determing the Height of the Objects (Trees, School, Flagpoles, etc.)

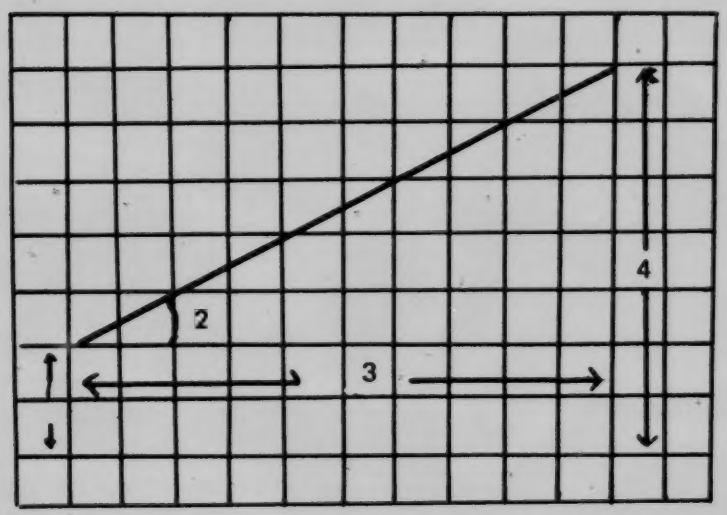
Because in most situations it will be impossible to measure the height of the tree directly, a method of estimation will be needed. A variety of methods have been presented. The student should be given the opportunity to try each method in order to find out for himself which method is the more accurate and under what circumstances a particular method can be used successfully. The need to use several methods and take an average might also be discovered. These methods could also be utilized for other objects and in other studies. It is wise to practice estimation techniques first on shorter objects whose height can be easily measured in order to test for accuracy, i.e. the average hydro pole is 29-1/2 feet high: buildings whose height is known or can be measured.

1. Using an Angle Finder Construct a simple astrolabe as shown in the diagram. Set it up at a convenient distance from the tree so that by sighting along the arm the top of the trees can be seen. Greater accuracy can be achieved if the angle formed by the plumb line and the protractor is measured four to five times and then averaged. Measure the distance from the astrolabe to the base of the tree with a tape measure or rope marked off in six inch intervals. Use a protractor and graph paper to reconstruct the triangle to scale, then measure the side of the triangle with a ruler.

   Be sure to add the height of the astrolabe from the ground when calculating the height of the tree.



PLOT ON GRAPH PAPER

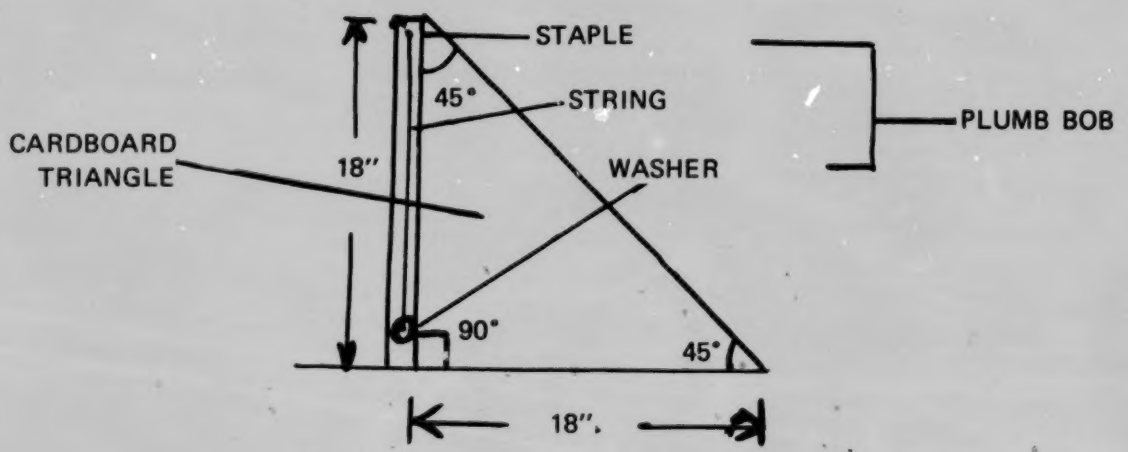


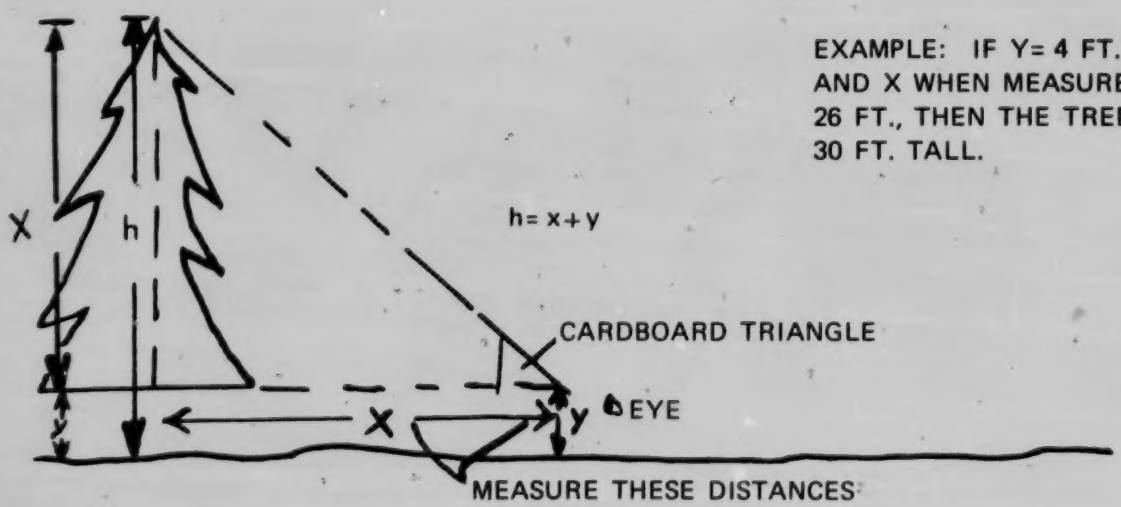
1. Height of astrolabe
2. Angle of astrolabe
3. Distance of astrolabe to base of tree
4. Height of tree

EACH SQUARE REPRESENTS FIVE FEET

2. 45, 45, 90 Degree Triangle Method Make a cardboard triangle as shown in the diagram. Start close to the tree and move backwards sighting along the hypotenuse until the top of the tree can just be seen. Use the string and weight to be sure that the triangle is plumb or level. Measure the distance from your eye to the base of the tree and from your eye to the ground. Use these measurements in the formula as shown below.

Note: The ground must be fairly level to obtain accuracy with this method. A partner may be needed to help with the plumb bob levelling.



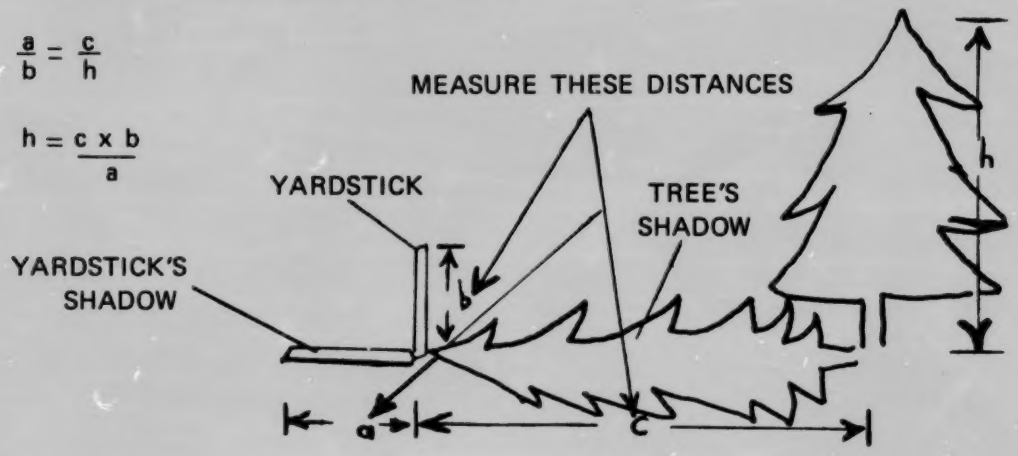


EXAMPLE: IF Y= 4 FT. AND X WHEN MEASURED IS 26 FT., THEN THE TREE IS 30 FT. TALL.

3. The Shadow Method Have a pupil stand at the end of the tree's shadow where it falls on the ground. You could use a yardstick instead of the pupil. Measure the length of the tree's shadow, the pupil or yardstick's shadow and their height. By using the idea of proportion and by applying these measurements in the formula below the height of the tree can be calculated.

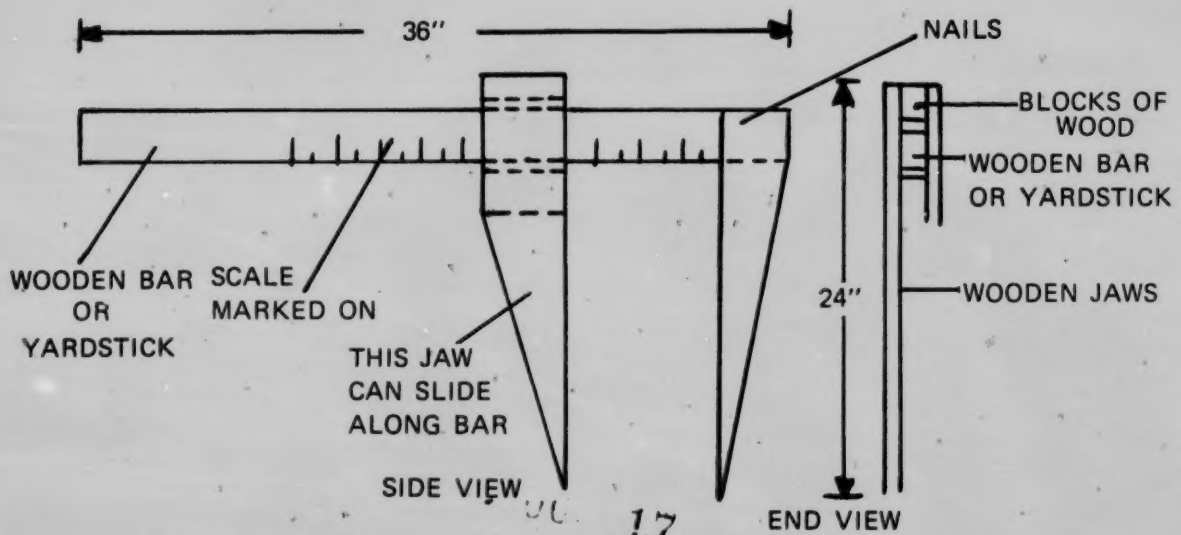
$\frac{a}{b} = \frac{c}{h}$

$h = \frac{c \times b}{a}$



4. Measuring the Diameter of the Trunk In order to measure the diameter of the trunk the pupils might construct a pair of large callipers similar to the one shown below. These could be used at the same spots painted on the tree at which the measurements for height and circumference were made in the previous activities.

Wooden Callipers



Pupil Investigations

The pupil could use the callipers to find:

1. How the diameter varies when measured at the same height but in a N-S, E-W, E.E.-S.W., N.W. - S.E. direction. Use a compass to establish these directions.
2. How the diameter changes as one progresses up the tree trunk. Take measurements at regular intervals.
3. How do the diameter and circumference compare? Perhaps the pupils could discover the mathematical relationship between these two measurements.
4. What conditions occurring in nature might help to account for variations found in question one? (Prevailing winds, injury to the tree, distance from other objects or trees, etc.)

SCHOOL YARD

Mini Climates (Making Scientific Measurements)

Equipment for Each Person:
- 2 thermometers with no scales (available from Spectrum Educational Supply, 9 Dohme Ave., Toronto 16 --- approximately 20¢ each)
- 1 Vis-a-vis marker (water soluble ink)

Activity

1. Mark the level of the alcohol with the marker. (on each thermometer)
2. Take the thermometers outside and select two sites:
   (a) a place where you think the temperature will be very warm
   (b) a place where you think the temperature will be very cool
3. Place the thermometers at each site and leave for fifteen minutes.
4. Collect the thermometers and mark the new level of the alcohol with the marker.
5. Compare:
   (a) your result with your prediction
   (b) the warmest and coolest place outside
   (c) places where the temperature went up when you predicted it would go down ... Why?
   (d) places where the temperature went down when you predicted it would go up ... Why?
   (e) the total number of warm places and cool places
   (f) the new levels of the warms and cools by laying the thermometers side-by-side
6. Wash the ink off the thermometer blanks.

* Some classes might wish to experiment with the thermometers in ice water and warm water before using them outside.

Mapping Mini Climates: On a sketch map of the school and grounds, mark the location of the cools with blue dots or stars and the warms with red dots or stars. Discuss the pattern obtained.

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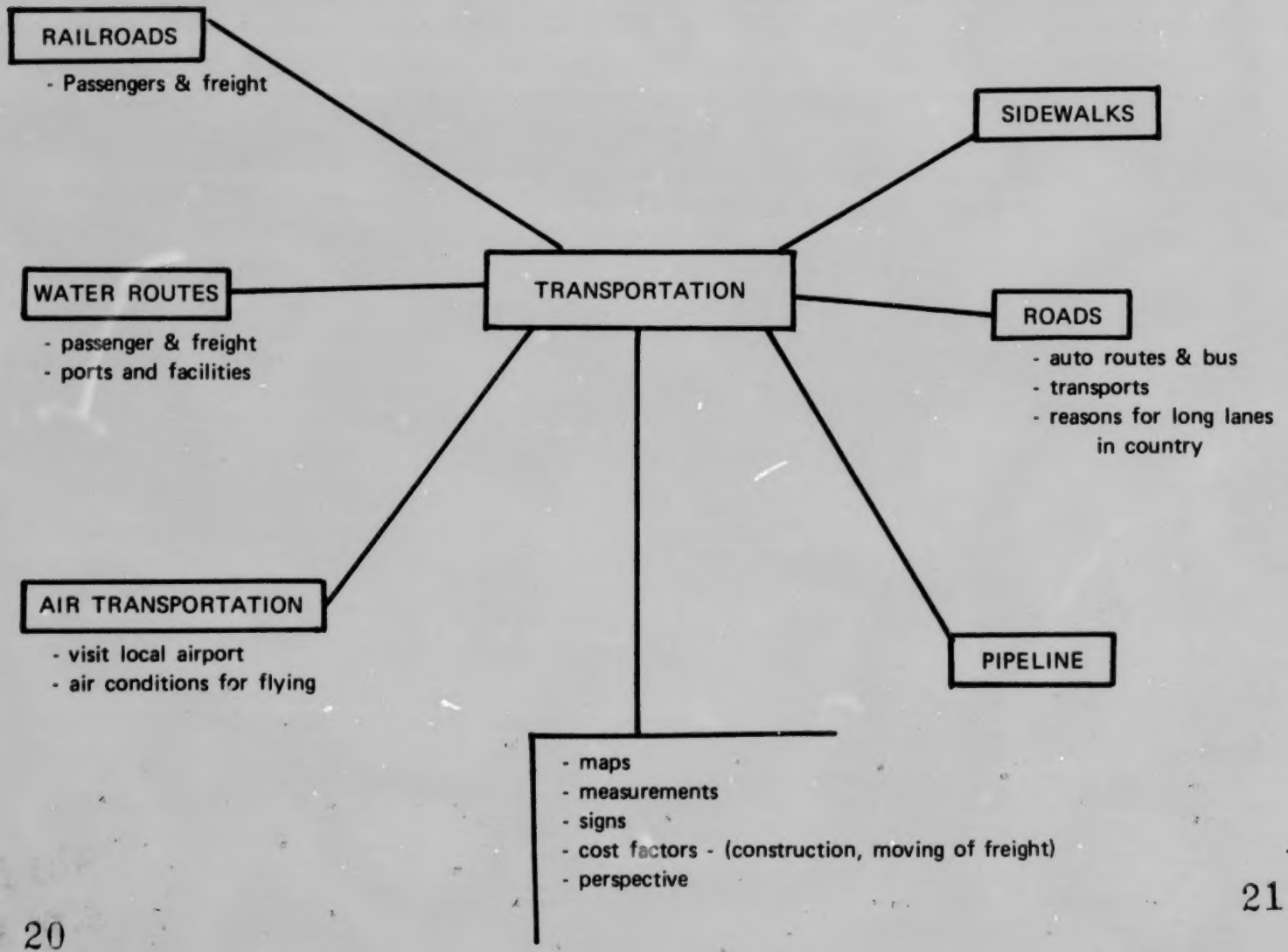
RAILROADS
- Passengers & freight
SIDEWALKS
WATER ROUTES
- passenger & freight
- ports and facilities
TRANSPORTATION
ROADS
- auto routes & bus
- transports
- reasons for long lanes in country
AIR TRANSPORTATION
- visit local airport
- air conditions for flying
PIPELINE
- maps
- measurements
- signs
- cost factors - (construction, moving of freight)
- perspective

TRANSPORTATION

Transportation would appear to lend itself particularly to Language Arts, Social Studies and Applied Sciences. The varying modes of transportation and the historical development of forms of travel are of immediate interest to many students and may be related to the degree of industrialization and the economic state of the country.

A traffic survey may be taken to aid in persuading a council of the need for traffic guards, railroad crossings, stoplights, etc.

CASE 1

In order to determine the speed of passing vehicles a set distance must be marked out. Preferrably in a multiple of 88 ft. say 440 ft. If a vehicle took 5 seconds to travel from one marker to the other then he would be travelling 60 m.p.h., 10 sec. would be 30 m.p.h. One then needs a stop watch to record time, the average speed in a zone is useful information, along with frequency i.e. the number of cars over a set period of time. If a guard at a crossing is needed the period of time the guard would be on duty should coincide with the count.

CASE 2

In other situations it may be that a suburban area is receiving rush hour traffic. This may be a hazard to children and pedestrians. The information needed here then would include a quiz. Such a quiz would require stopping traffic to find (a) The Local Traffic (b) The Through Traffic. Three simple questions may be quickly asked:

1. Where do you work? ☐ Local Factories
   ☐ Distant Factories
2. Where are you going? ☐ Live Locally
   ☐ Live Distant
3. Do you travel this route frequently? ☐ Yes
   ☐ No

From this information the need for stop signs to control traffic or lowering of speed limits may be necessary to discourage through traffic in a residential area.

CASE 3

Frequency of traffic build up at intersections may aid in persuading authorities to install traffic signs.

Cases 1 and 3 may be done without disturbing transportation.
Case 2 would need approval of a town or city council.

The cases mentioned here in taking a traffic survey may give students a form of meaningful employment in co-operation with the local town or city council.

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1. Comparing the slopes of various hills.
2. Observation of different types of vegetation on hills.
3. If the slope of the hill is great, is there a sign of erosion?
   Causes or Prevention of?
4. On a suitable hill children could set up experiments to answer some of the following questions:
   (a) How is the distance travelled by a toboggan affected by the following:
      i) weight carried
      ii) length of the toboggan
      iii) type of toboggan (aluminum, wooden, sheets of plastic, cardboard boxes, etc.)
      iv) shape of toboggan
      v) waxing
      vi) position of the rider(s) on the toboggan
      vii) stance of rider(s)
      viii) slope of the hill
      ix) snow depth
      x) snow condition? (Dry or wet)
   (b) How is the speed of the toboggan affected by (i) - (x) above?

   If the class were divided into ten groups each one studying the toboggan from the point of view of one of (i) - (x) in terms of distance, speed and control, they could each make up a set of questions to be answered by experiment.
5. Run up-time? Run down - time? Variance?
6. Concept of area one is able to see from a hill in comparison with sight from a flat area
7. Bird nests located in a bluff (or bank) or side of sand or gravel pit.
8. Evidence of other forms of animal life.
9. Composition - how hill was formed.
10. Refer to page 69 in Map and Compass.

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Old Cemeteries

Exploring Cemeteries

The following questions might be presented as problem solving situations on a field trip to a cemetery.

1. Find the oldest tombstone.
   (a) From what material was the oldest tombstone made?
   (b) Where is the oldest tombstone located in the cemetery - Front? Rear?
   (c) How old was the individual who died?
   (d) Is there a footstone? How far is the footstone from the headstone?
   (e) What kind of vegetation is growing on or near the grave?
   (f) Are there any trees growing adjacent to, or on the grave? How old are the trees?
2. Find the most recent tombstone.
   (a) From what material was the most recent tombstone made?
   (b) Where is the most recent tombstone located in the cemetery. Front? Rear?
   (c) How old was the individual who died?
   (d) Is there a footstone? How far is the headstone from the footstone?
   (e) Are there any trees growing adjacent to or on the grave? How old are the trees?
3. When was the graveyard abandoned?
   (a) How old is the biggest tree growing adjacent to a tombstone or on the grave?
   (b) What is the date of the latest burial plot?
4. What is the condition of the soil?
   (a) on the oldest grave
   (b) on the most recent grave
5. Measure the depth of the inscriptions
   (a) on the oldest tombstone
   (b) on the most recent tombstone
6. Is there evidence of a predominance of a single family?
7. What is the average age of death in 10 year intervals?
   For men? For women? For children?
8. Do the designs, shapes and materials of the tombstones change through the years? If so, how?
9. Are there any graves that do not have tombstones? How can you tell it is a grave?
10. Can the tombstone and its general appearance relate what the standard of living was for the particular family or era?
11. Is there a fence or fencerow surrounding the graveyard? If so, what kind of fence or fencerow?
12. Is there evidence of a building? If so, what kind of buidilng was it? For what purpose was it used?
13. Did the women live longer than the men? Was this true for one particular era?
14. Is there evidence of an epidemic? What kind of evidence?

15. Are there any unusual epitaphs on the tombstones? If so, why are they unusual?

These are just some of the many questions which can be utilized by a teacher and class for exploring an old cemetery.

Tracings

A further technique can be employed with care. Tracings of tombstones can be made by covering the entire face of the stone with kraft paper and securing it to the sides with masking tape. Wax crayon or soft graphite rubbed over the paper will reproduce the inscription underneath. Care should be taken to avoid defacing the stone or monument.

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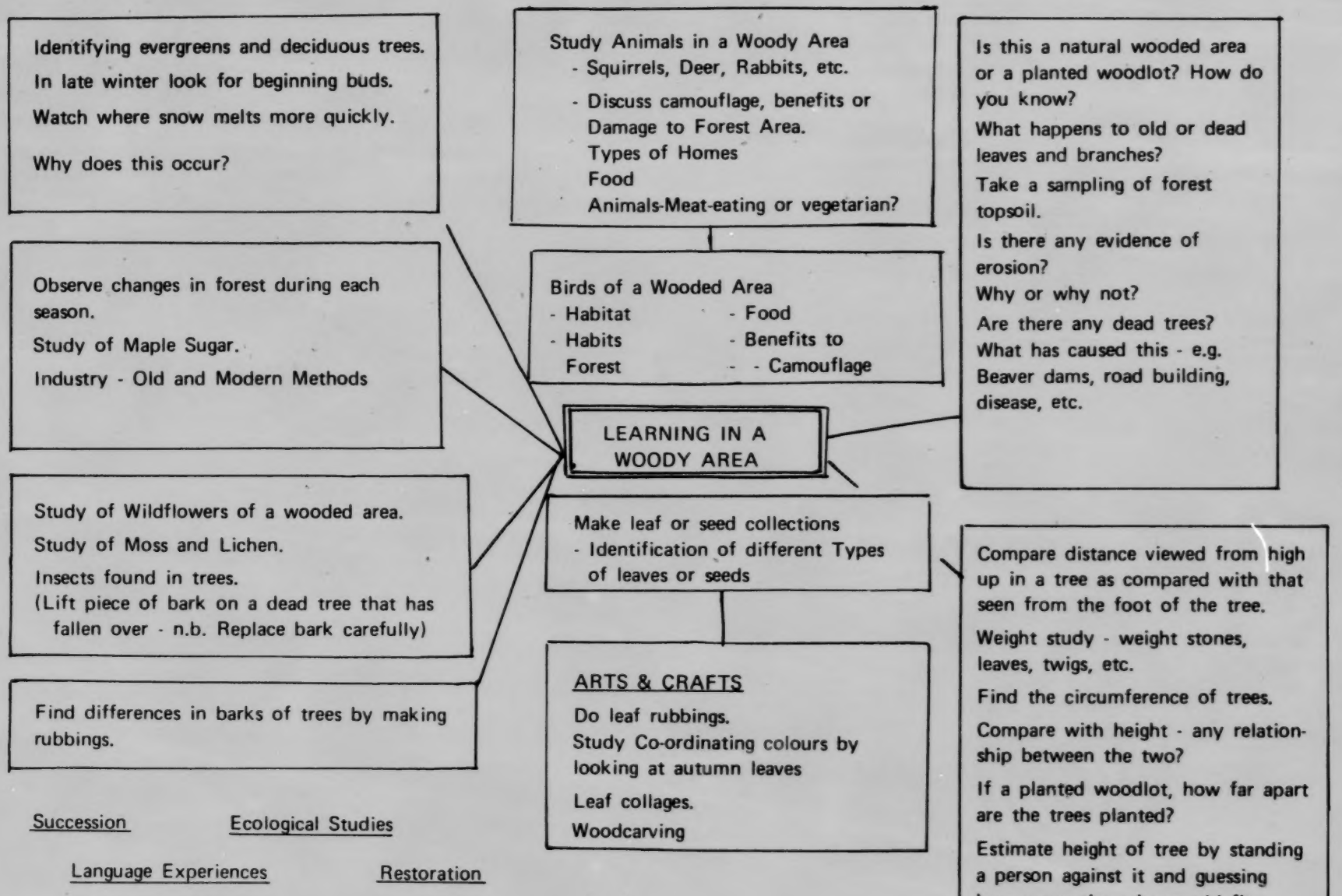

Identifying evergreens and deciduous trees.
In late winter look for beginning buds.
Watch where snow melts more quickly.
Why does this occur?
Study Animals in a Woody Area
- Squirrels, Deer, Rabbits, etc.
- Discuss camouflage, benefits or Damage to Forest Area.
Types of Homes
Food
Animals-Meat-eating or vegetarian?
Is this a natural wooded area or a planted woodlot? How do you know?
What happens to old or dead leaves and branches?
Take a sampling of forest topsoil.
Is there any evidence of erosion?
Why or why not?
Are there any dead trees?
What has caused this - e.g. Beaver dams, road building, disease, etc.
Observe changes in forest during each season.
Study of Maple Sugar.
Industry - Old and Modern Methods
Birds of a Wooded Area
- Habitat
- Habits
Forest
- Food
- Benefits to
- Camouflage
LEARNING IN A WOODY AREA
Study of Wildflowers of a wooded area.
Study of Moss and Lichen.
Insects found in trees.
(Lift piece of bark on a dead tree that has fallen over - n.b. Replace bark carefully)
Make leaf or seed collections
- Identification of different Types of leaves or seeds
Compare distance viewed from high up in a tree as compared with that seen from the foot of the tree.
Weight study - weight stones, leaves, twigs, etc.
Find the circumference of trees.
Compare with height - any relationship between the two?
If a planted woodlot, how far apart are the trees planted?
Estimate height of tree by standing a person against it and guessing how many times he would fit against it.
Use seeds for counting purposes.
Find differences in barks of trees by making rubbings.
ARTS & CRAFTS
Do leaf rubbings.
Study Co-ordinating colours by looking at autumn leaves
Leaf collages.
Woodcarving
Succession
Ecological Studies
Language Experiences
Restoration

HUMAN

ANIMALS IN WINTER DATA SHEET

Diagram of Footstep
Size of footstep_____inches

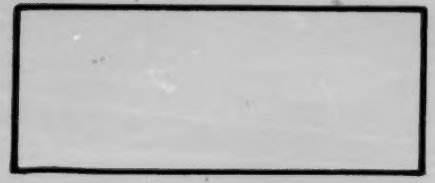


Diagram of Walking Pattern
Distance between steps___inches

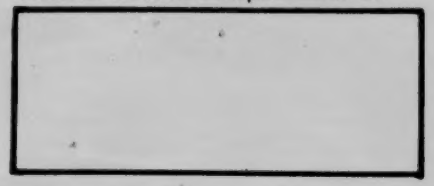
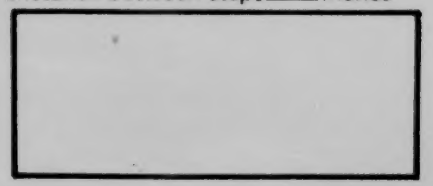


Diagram of Hopping Pattern
Distance between steps___inches

Diagram of Running Pattern
Distance between steps____inches



ANIMAL TRACKS SEEN

	Diag. of Track	Size of Print	Dist. Between Prints	How Animal Was Travelling	Location Where First Seen	Places Animal Visited	Other Signs From the Animal	Unusual Signs of Other Animals	Name of Your Animal
1									
2									
3									
4									

IDENTIFICATION OF FOREST TREES IN WINTER CONDITIONS

1.	White Pine	- 5 needles in a cluster - needles 5" long
2.	Red Pine	- 2 needles in a cluster - needles 5" - 6" long
3.	Scotch Pine	- 2 needles in a cluster - needles 2" long - needles twisted together
4.	Jack Pine	- 2 needles in a cluster - needles 1-1/4" long - needles spread apart to form V
5.	White Spruce	- single needles - 4-sided needles which roll between fingers - twig colour brownish - stalk at base of needle
6.	Norway Spruce	- single needles - 4-sided needles which roll between fingers - twig colour orangish - twigs have drooping effect on tree
7.	Balsam Fir	- needles single - flat needle which will not roll between fingers - needles 1" long - needles have no stalk or stem at base
8.	Hemlock	- needles single - flat needle which will not roll between fingers - needle 1/2" long - needle has a stalk or stem at base - needle has two white lines on under surface
9.	White Cedar	- needle scale-like - scales 1/8" long - branch is flat and has fan-like appearance
10.	Red Cedar	- needle scale-like - scales too small to see with naked eye - branch has a cord-like appearance
11.	Tamarack	- only conifer which loses needles in winter in Canada - buds hard, round, red in colour

PLANT LIFE -- TREES DATA SHEET

Tree Number 1 Name: _____

Shape (Diagram)	Bark Pattern (Diagram)	Bark Colour
		Depth of Grooves in Bark

Twig (Diagram)	Leaf Scar (Diagram)	Bud Arrangement
		Length of Last Year's Growth

Tree Number 2 Name: _____

Shape (Diagram)	Bark Pattern (Diagram)	Bark Colour
		Depth of Grooves in Bark

Twig (Diagram)	Leaf Scar (Diagram)	Bud Arrangement
		Length of Last Year's Growth

THE FOREST COMMUNITY

1. A forest community is a natural area in which the various living things depend upon each other just as we in our communities depend upon others for our food and shelter.

2. If a natural area is left alone, the number of individuals of each kind of plant and animal remains about the same. This is called "Balance of Nature."

3. Look up and write the definition for each of the following words. These are types of animals which help to maintain the Balance of Nature.

Predator _____

_____

Herbivore _____

_____

Carnivore _____

_____

Parasite _____

_____

Scavenger _____

_____

4. Give three ways in which man upsets the Balance of Nature.

5. Give three natural disasters that upset the Balance.

6. See how many food chains you can make from the following:

cow	robin	mink
man	grass	cherries
mouse	seeds	insect
fox	hawk	woodpecker

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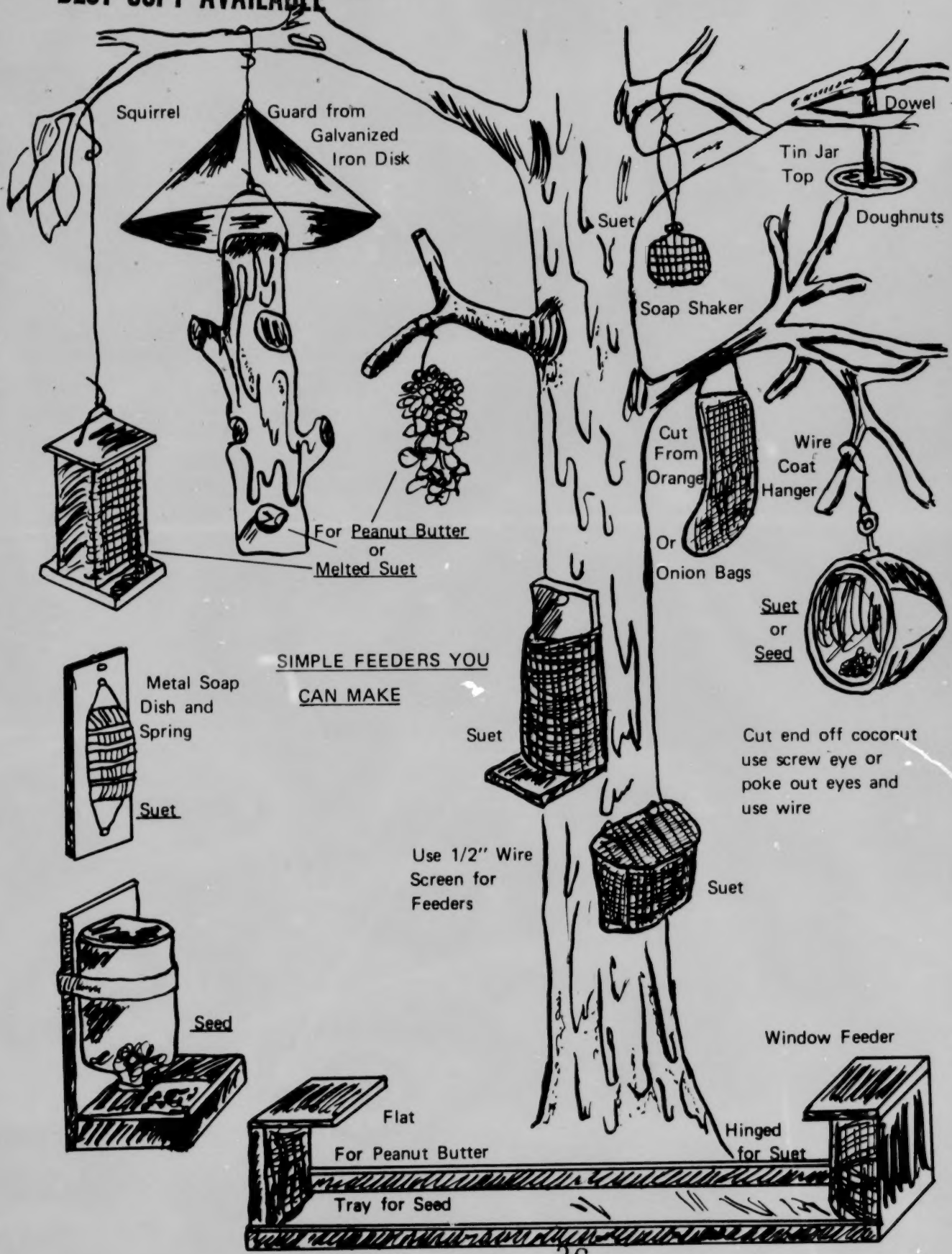
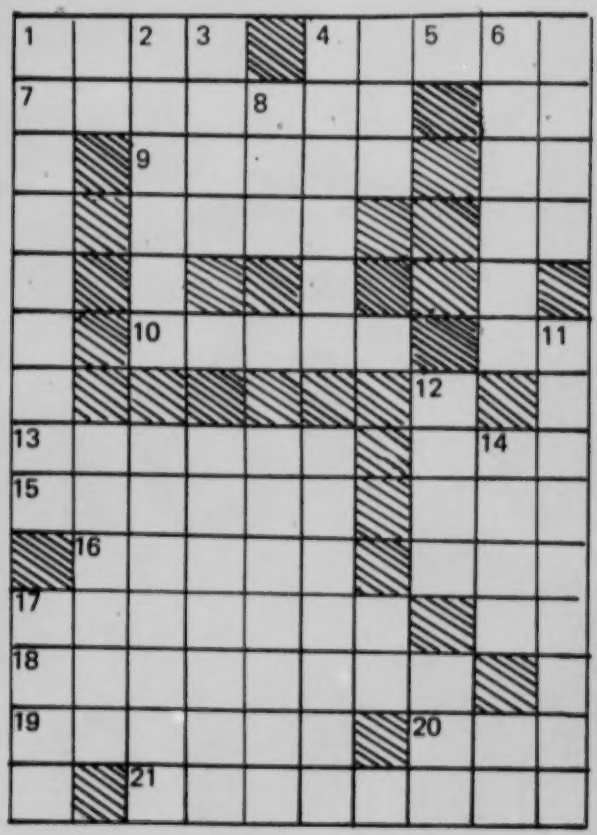


NATURE PUZZLE



DOWN

1. Eats dead things.
2. Animal with six legs.
3. Each object in a food chain.
4. Sneezy seasoning.
5. Balance in_____.
6. Source of wood.
8. Best Christmas tree.
11. Keeps its leaves all winter.
12. Slick jumping amphibian.
14. First warm-blooded animals.
17. Name of an animal on which a parasite lives.

ACROSS

1. Most important natural resource.
4. Mineral,_____, and Animal Kingdom.
7. Tree that bears cones.
9. Night bird hunted with a sack. (A joke)
10. Not here.
11. Winter weasel fur.
15. Chisel-toothed animal.
16. Conifer with scales.
17. Animal's natural community.
18. Eats everything.
19. Conifer with square needles.
20. Sight organ.
21. Changing crops on a field from year to year.

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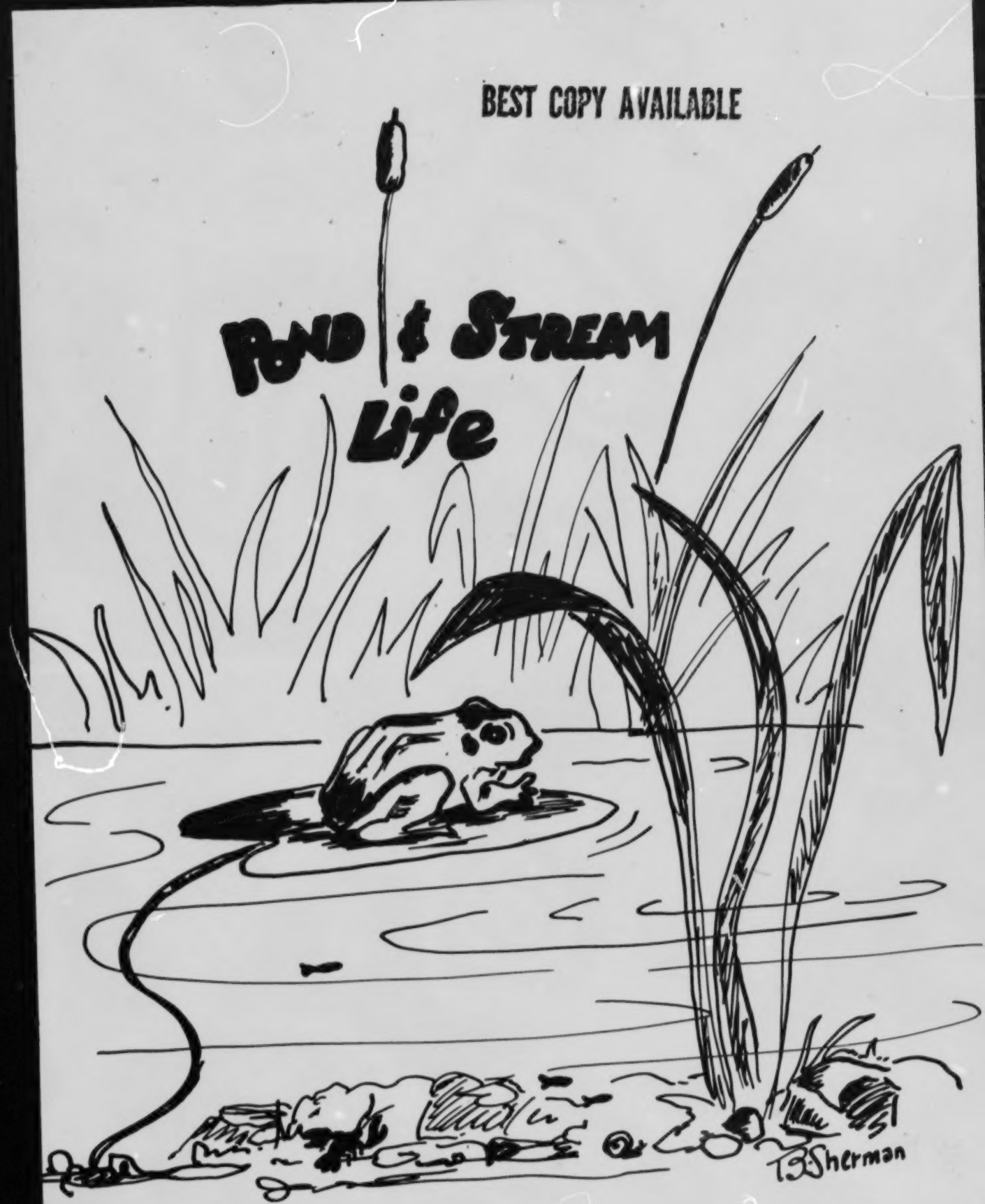

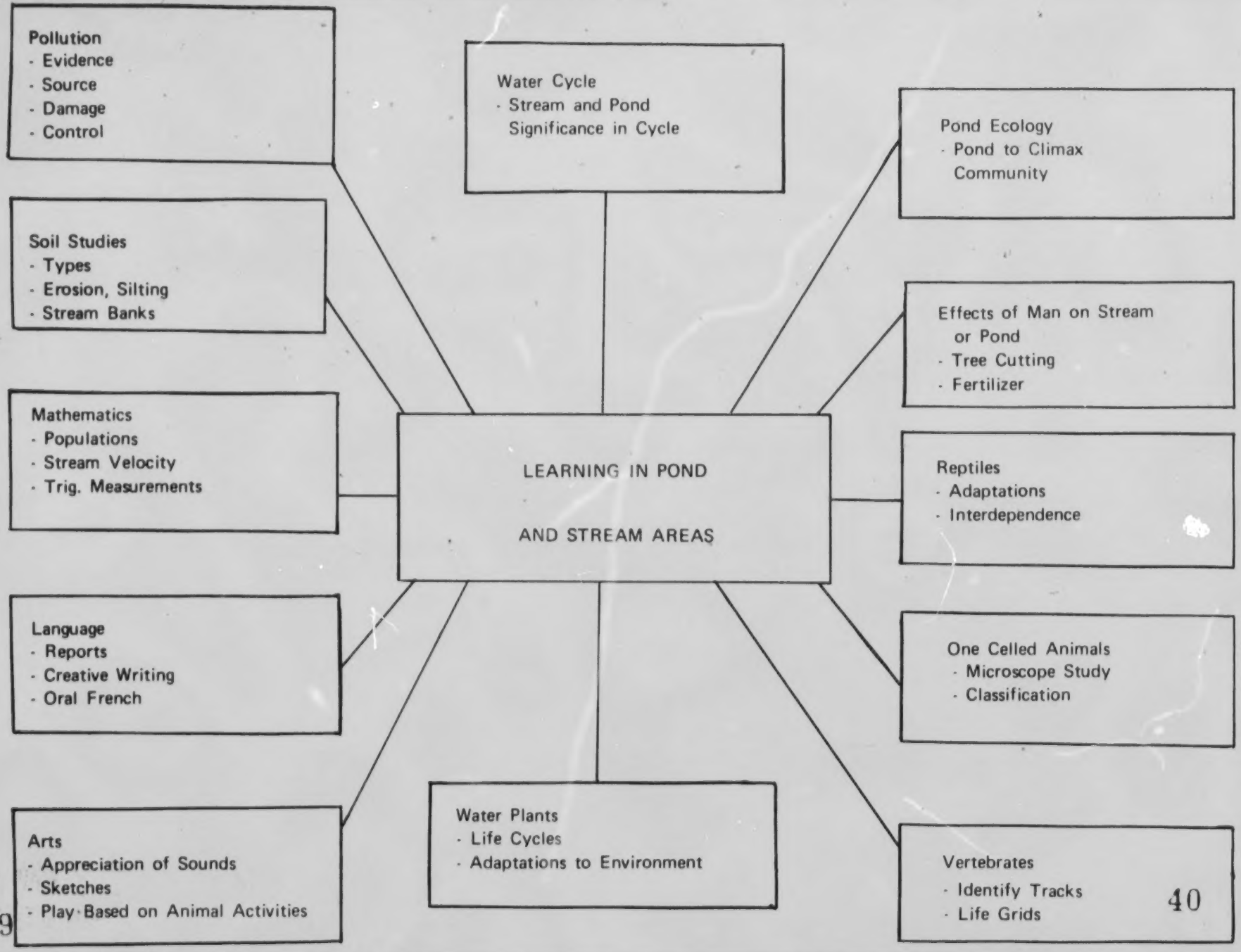
Pollution
- Evidence
- Source
- Damage
- Control
Water Cycle
- Stream and Pond
Significance in Cycle
Pond Ecology
- Pond to Climax
Community
Soil Studies
- Types
- Erosion, Silting
- Stream Banks
Effects of Man on Stream
or Pond
- Tree Cutting
- Fertilizer
Mathematics
- Populations
- Stream Velocity
- Trig. Measurements
LEARNING IN POND
AND STREAM AREAS
Reptiles
- Adaptations
- Interdependence
Language
- Reports
- Creative Writing
- Oral French
One Celled Animals
- Microscope Study
- Classification
Arts
- Appreciation of Sounds
- Sketches
- Play Based on Animal Activities
Water Plants
- Life Cycles
- Adaptations to Environment
Vertebrates
- Identify Tracks
- Life Grids

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WATER INSECTS

There are many types of insects that make the pond their home. Some of these are bugs, beetles, damsel flies, dragonflies, moths, mayflies, and caddis flies. The water bugs and water beetles illustrate two common life cycles of insects.

INCOMPLETE LIFE CYCLE

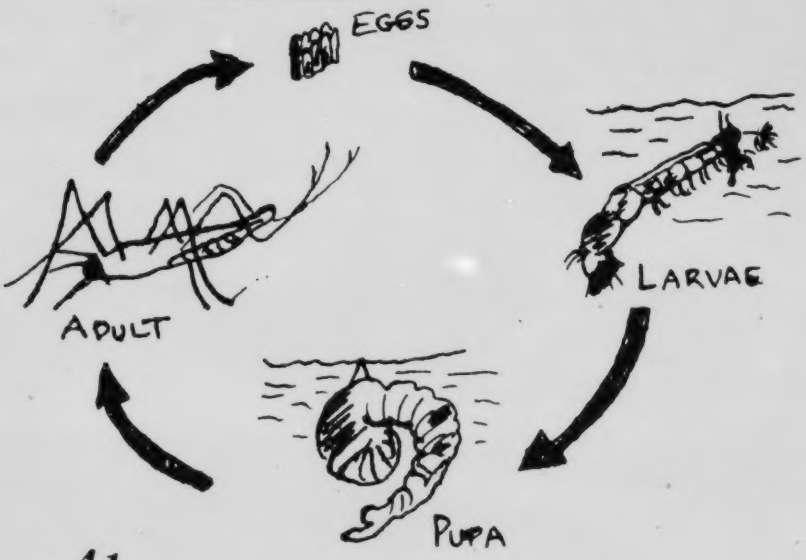
DRAGONFLY

WATER BUGS

Bugs are insects that go through only three stages in their life cycle. The nymph, which is the second stage, resembles the adult, except that nymphs are smaller and lack wings.

COMPLETE LIFE CYCLE

MOSQUITO



WATER BEETLES

Beetles are insects that have four stages in their life cycle. The larva is a grub that has many legs. The pupa is the resting stage where many physical changes take place and from which the developed adult emerges. This really is not a resting stage as such since the larva gradually develops into the adult.

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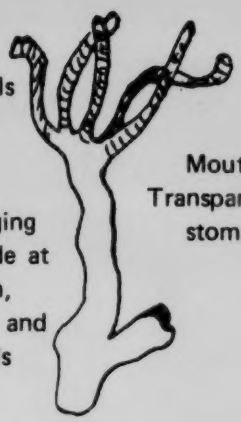
HYDRAS

These are small fresh water animals (1/4" long) with extended tiny waving tentacles covered with stinging cells which explode at the slightest touch, stunning the prey and dragging it towards its mouth.



THE DRAGONFLY NYMPH

is another animal which moves by jet propulsion. Water is expelled from the internal breathing apparatus located in the stern.

Huge lower jaw may be easily extended to capture animals even larger than itself for food.

NATURE'S FIRST SNORKEL

The water scorpion has a breathing tube which it can thrust up through the surface for air.

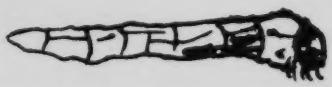
BACK SWIMMERS

These animals swim continually on their back because of the location of their eyes.

Back swimmer breathing with hind tip of body thrust up through the surface.

THE CADDIS FLY

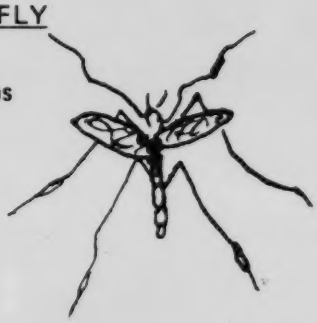
lives in a self made case of pebbles, sticks, leaves or even fibre. Water is forced inside the tube continually for



breathing. The case acts as camouflage rather than protection as in the turtle.

THE CRANE FLY

Walks on the water by means of built in air sacs



In the larva stage this too breathes by means of a snorkel tube.

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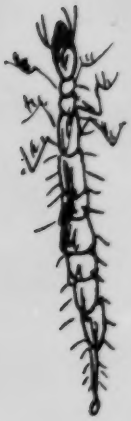
DAMSELFLY

TRUE FLY

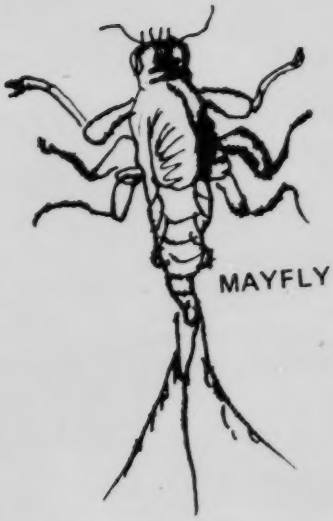


BEETLE

STONEFLY

WATER BOATMAN

BACKSWIMMER



MAYFLY

DRAGONFLY

CADDIS CASES

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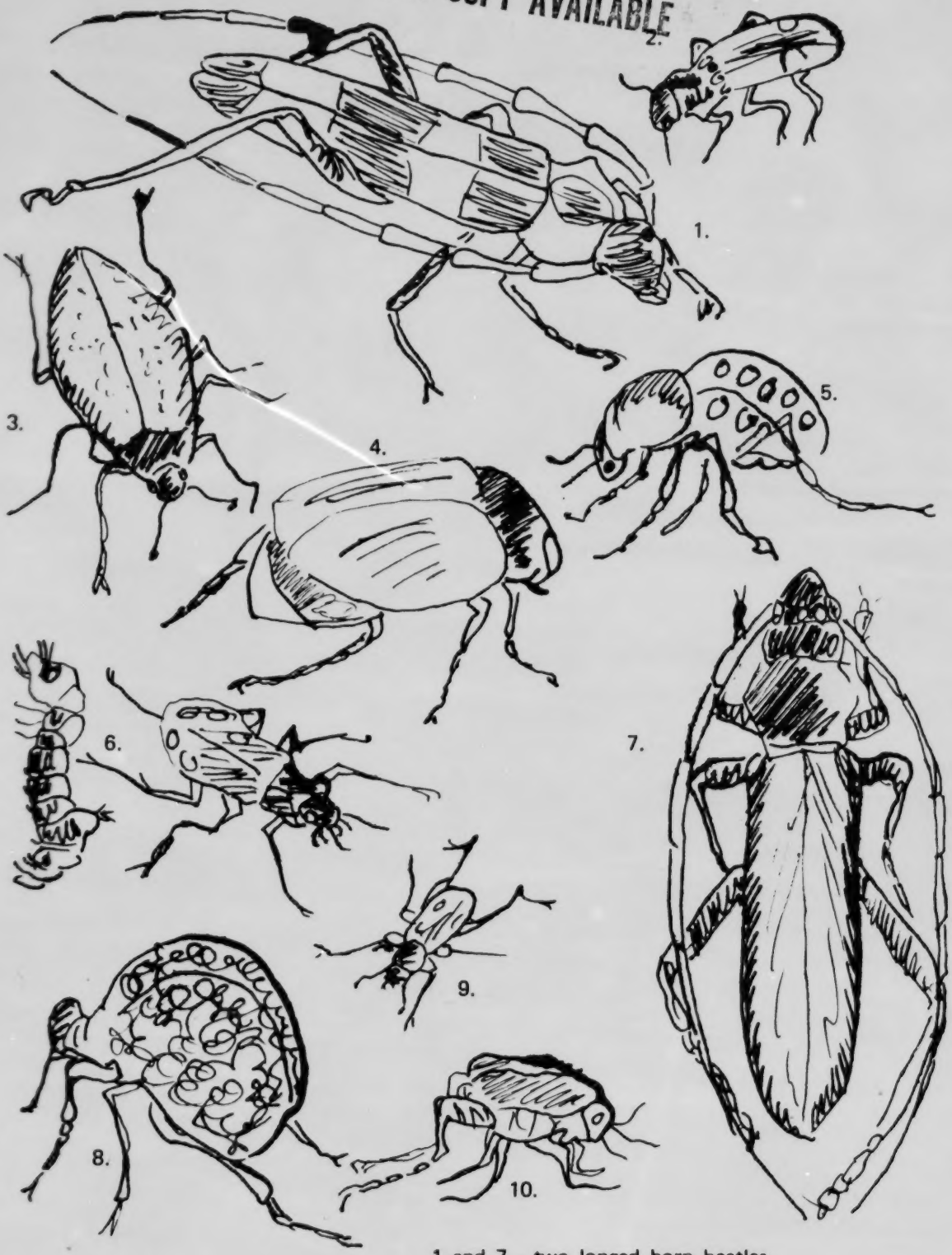


1 and 7 - two longed horn beetles
2 and 9 - two checkered beetles
3 - a fungus beetle
4 and 10- two scarab beetles
5 - a snout beetle
6 - a tiger beetle and its larva (grub)-doodlebug
8 - a blister beetle

POND CHECKLIST

Insects

1. backswimmer.....
2. caddis fly.....
3. damsel fly - adult.....
   - nymph.....
4. dragonfly - adult.....
   - nymph.....
5. giant water bug.....
6. mosquito - larva.....
   - adult.....
7. stonefly.....
8. water boatman.....
9. water mites.....
10. water strider.....
11. whirligig beetle.....

Crustaceans

1. crayfish.....
2. fairy shrimp.....
3. scud.....

Mollusks

1. great pond snail.....
2. pond snail.....
3. tadpole snail.....
4. wheel snail.....

Amphibians

1. american toad.....
2. fowler's toad.....
3. leopard frog.....
4. pickerel frog.....
5. green frog.....

Fish

1. dace.....
2. shiner.....

Reptiles

1. garter snake.....
2. painted turtle.....
3. snapping turtle.....

Plants

1. algae.....
2. arrowhead.....
3. bur-reed.....
4. cat-tail.....
5. duck weed.....
6. eel-grass.....
7. water plantain.....

STREAM SURVEY

Purpose

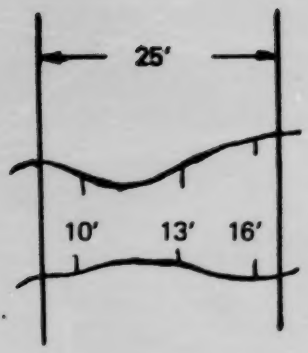
The purpose of this exercise is to study the stream as a community.

Suggested Activities Prior to the Field Visit

1. Film - "Trout Stream" - Department of Education.
2. Discussion of factors which influence survival of fish in a stream or river.
3. Collection of jars and construction of small dip nets.
4. Observation of habits of fish in a balanced aquarium.

Field Lesson

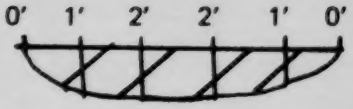
1. Introduction
   a) Discuss the conditions necessary in a stream for survival of trout.
   b) List the following jobs for students to complete.
      i) Water temperature
      ii) Fish living in stream now (competition for trout).
      iii) Food available.
      iv) Bank and bottom conditions - shade, erosion, etc.
      v) Rate of flow - formula: $\frac{L \times W \times D \times .8}{t}$
   c) Divide class into groups of three and set up a rotary system whereby they rotate jobs until they have completed the survey.
2. Method and Breakdown Information
   a) Water Temperature
      Trout require cold water to survive. Have the group obtain water temperature to see if it is suitable (40° - 55°) F.
   b) Fishing
      Have group get into water using seine nets to catch fish living there already. Hip waders are preferable, but if not available, students can wear shorts and an old pair of shoes. Collect fish in a bucket and allow students to use field guides to identify the fish they have collected. (Zim series book on Fish)
   c) Food
      Search in the water, under rocks and logs. Collect insects and allow students to study and identify using field guides. Some specimens may be taken back to the school and placed in an aquarium for further study.
   d) Bank and Bottom Conditions
      Check amounts of shade, erosion, depth of silt on bottom, location of deep pools and shallow sections of the stream.
   e) Rate of Flow
      i) Mark off an area of 25 feet.
      ii) Measure or estimate the average width of this section.
      iii) Measure the average depth of the stream.
      iv) .8 is the co-efficient of friction.
      v) Drop an object into the stream and estimate the time it takes to pass through the 25 ft. section.



L - 25'
W - 13'
D - 1'
t - 120 seconds

$$\frac{L \times W \times D \times .8}{t} = \frac{25 \times 13 \times 1 \times 8/10}{120} = 2\text{-}1/6 \text{ Cu. Ft./Sec.}$$

AVERAGE DEPTH



Equipment

1. 1 seine net per group.
2. 2 buckets per group.
3. Dip nets.
4. Hip waders.
5. 100 ft. tape.

Follow-up

1. Identification of fish and insects in Field Centre labs and in regular classroom.
2. Setting up a balanced aquarium.
3. Visit to a trout hatchery.
4. Fishing excursion to Conservation Area.
5. Visit to a local stream for a comparative study.
6. Suggestions for improving the stream to support trout life.

STREAM SURVEY

NAME _____
GROUP _____

A. Water temperature _____
Air temperature _____

B. Types of Fish
1. Suckers _____
2. Black-nosed dace _____
3. Shiners _____
4. Darters _____
5. Red-bellied dace _____

C. Food Available
1. Dragon Fly _____
2. Caddis Fly _____
3. Mayfly _____
4. Stonefly _____
5. Dobson Fly _____
6. Others _____

D. Bank Conditions
Heavy erosion _____
Light erosion _____
No erosion _____
Good shade _____
Insufficient shade _____

E. Bottom Conditions
Heavy silt _____
Light silt _____
Rock _____
Gravel _____

F. Rate of Flow

$$\frac{L \times W \times D \times .8}{t}$$

Length =
Width =
Average depth =
Time =

G. Suggestions for Stream Improvement

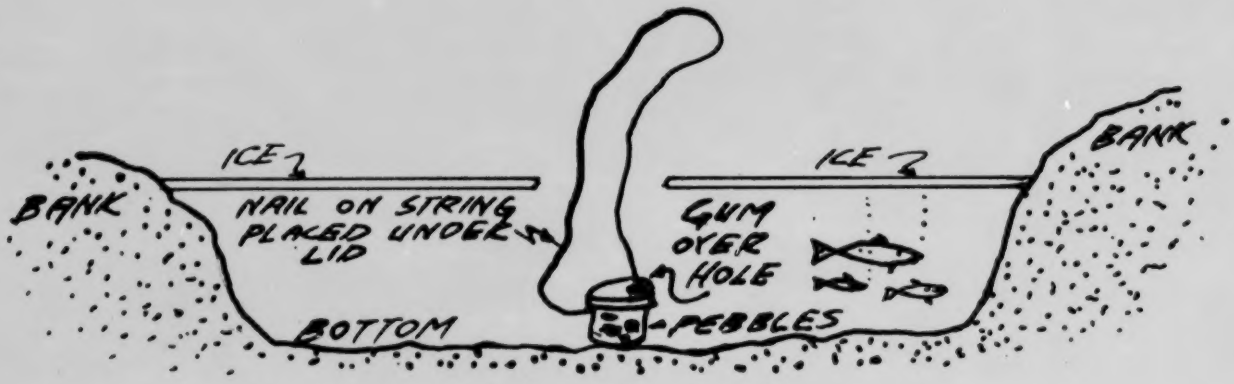
CREEK STUDY IN WINTER

Equipment

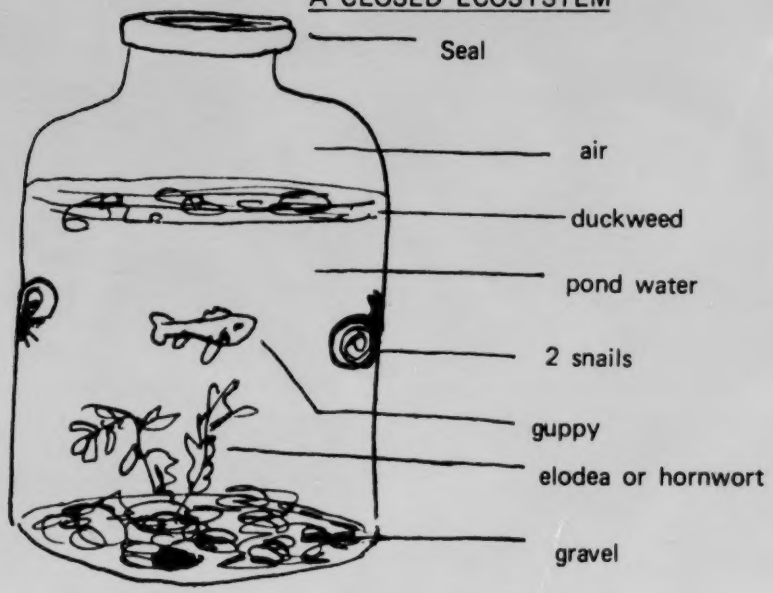
Ice auger or ice spud, thermometer, baby food jar with lid, clean pebbles or crushed rock, at least 3 vials or baby food jars, 4 ft. of string, one 1" nail, one 4" nail, chewing gum, notebook, basket or pail, ruler.

Procedure

1. Form into groups of 3 to 5 (artist, recorder, temperature taker, 1 or 2 workers) pupils.
2. When you reach the creek make a sketch to show where you are doing your study. Record any signs of life (animal tracks, and trees and plants in the area.)
3. Make a hole in the ice. Note the different shades in the layers of ice. There may be only one layer. Measure the thickness of each layer of ice. Collect equal samples of each layer of ice to take back to the classroom for melting.
4. Record the temperature of the air. Record the temperature of the water at the surface. Get a sample of water from the bottom of the creek. Record the temperature of the water in the jar. Keep the water.
5. Collect rocks, plants, etc. from creek bed. Bring some water back in to the classroom to observe under a lens and a microscope. Bring back anything else of interest.
6. Show your findings on experience paper.



A CLOSED ECOSYSTEM

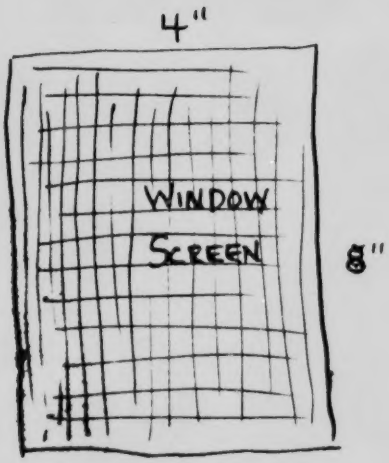


Glass Gallon Jug

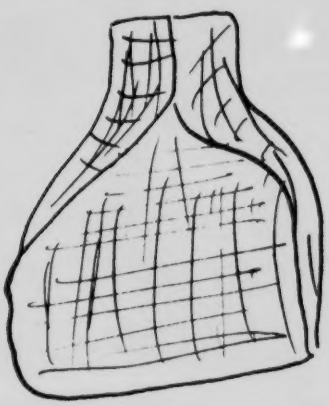
AIMS: To Teach Ecosystem Concept
Succession Concept

For a time changes will take place within the container.
Then a balanced state should be reached.

THE LIFTER (a simply made collection device for scooping in shallow water.)



two or three folds on both sides



fold in to centre at one end. This end then becomes the handle.

GENERAL ACTIVITIES

1. Determine how different depths and locations affect the water temperature.
2. Determine some different ways in which aquatic plants and animals can be classified.
3. Find evidence of plants and animals that make up various food chains.
4. Make a map of the different depths of a pond or stream.
5. Measure the distance across the pond or stream.
6. Determine the types and quantities of plant and animal life found in different locations and at different depths.
7. Determine the acidity and alkalinity in different locations.
8. Determine the turbidity of the water in different locations.
9. Determine the composition of the bottom of the pond or stream in different locations.
10. Compare the temperatures of the water to the temperatures of the soil around it.
11. Determine if the amount of sunlight and sunlight penetration affects the growth of aquatic vegetation.
12. Mark off the boundaries of the watershed of a pond.
13. Determine the surface area and volume of water in a pond or section of stream.
14. Find evidence of water pollution.
15. Collect some oxygen given off by aquatic plants.
16. Make a vegetation map of the plants in and around the pond or stream.
17. Use a microscope to examine small plants and animals found in the water.
18. Find aquatic animals in different stages of growth.
19. Construct check dams along streams.
20. Determine the rate of flow of a stream in various locations.
21. Determine the location of sediment deposition around the curves in a stream.

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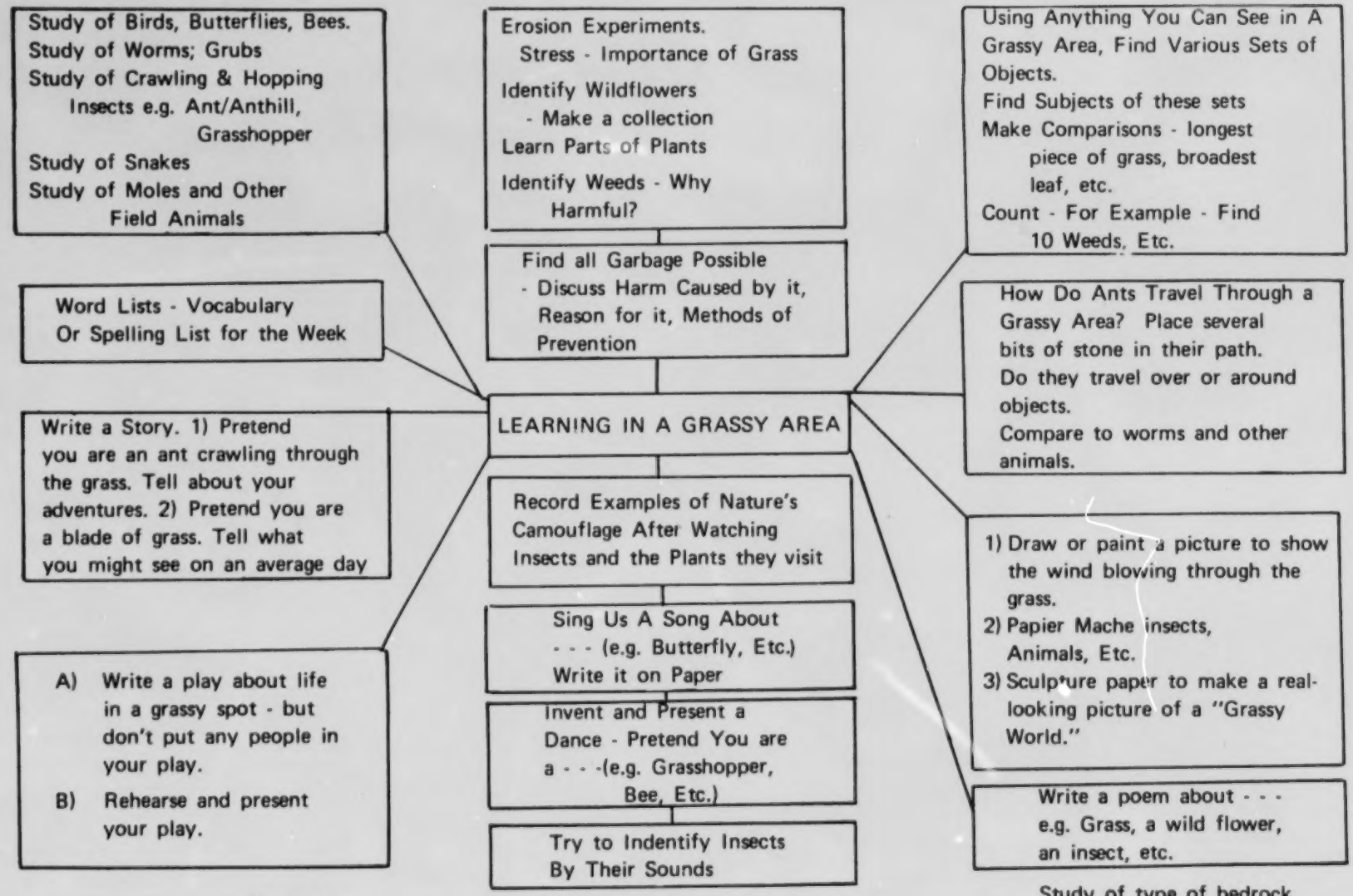

Study of Birds, Butterflies, Bees.
Study of Worms; Grubs
Study of Crawling & Hopping Insects e.g. Ant/Anthill, Grasshopper
Study of Snakes
Study of Moles and Other Field Animals
Erosion Experiments.
Stress - Importance of Grass
Identify Wildflowers - Make a collection
Learn Parts of Plants
Identify Weeds - Why Harmful?
Using Anything You Can See in A Grassy Area, Find Various Sets of Objects.
Find Subjects of these sets
Make Comparisons - longest piece of grass, broadest leaf, etc.
Count - For Example - Find 10 Weeds, Etc.
Find all Garbage Possible - Discuss Harm Caused by it, Reason for it, Methods of Prevention
Word Lists - Vocabulary Or Spelling List for the Week
How Do Ants Travel Through a Grassy Area? Place several bits of stone in their path. Do they travel over or around objects. Compare to worms and other animals.
LEARNING IN A GRASSY AREA
Write a Story. 1) Pretend you are an ant crawling through the grass. Tell about your adventures. 2) Pretend you are a blade of grass. Tell what you might see on an average day
Record Examples of Nature's Camouflage After Watching Insects and the Plants they visit
1) Draw or paint a picture to show the wind blowing through the grass.
2) Papier Mache insects, Animals, Etc.
3) Sculpture paper to make a real-looking picture of a "Grassy World."
Sing Us A Song About - - - (e.g. Butterfly, Etc.) Write it on Paper
A) Write a play about life in a grassy spot - but don't put any people in your play.
B) Rehearse and present your play.
Invent and Present a Dance - Pretend You are a - - -(e.g. Grasshopper, Bee, Etc.)
Write a poem about - - - e.g. Grass, a wild flower, an insect, etc.
Try to Indentify Insects By Their Sounds
Soil Survey
- microclimates
Plant and Animal Succession
Reforestation
Study of type of bedrock
Ecological Studies
Language Experiences

PLANT COVER - USING A FRAME

Equipment for each group - a clipboard, a pencil and paper for recording
- a grid frame, hula hoop, or a piece of string tied in a loop
- plastic bags for collecting specimens

ACTIVITY

1. Drop the frame at random onto the ground.
2. Observe the types of vegetation that are enclosed inside the frame.
3. Record the name and numbers of each plant within the frame with the exception of grass which is given a percentage cover or a fraction. If the pupils do not know the name of a plant, they should label it and give it a symbol so that in subsequent tosses the symbol can be recorded instead of collecting and labelling one each time.
4. Repeat 1 to 3 twenty times in various locations throughout the area that you have been assigned. Total your results.
5. Make a comparative graph of the various plants found in your area.
6. Collect one specimen of each plant that you found in your area and make a display.
7. If the teacher wishes to have the pupils measure the area that they were working in, they could then figure out the approximate numbers of each plant in the total area.
8. If half or more of a plant is inside the frame, then the plant is included in the count for that toss.

SCHOOL YARD & MEADOW (Primary)

"Bug Hunting" (Predicting, Observing and Analysing Data)

Equipment for a group of 4-6 persons--100 yellow toothpicks (vegetable dye)
100 green toothpicks
100 red toothpicks
100 blue toothpicks (ink)
100 black toothpicks (shoe polish)
40' string
4 posts or spikes

PREPARATION– (i) Mark off a ten foot square on a lawn using the string and stakes.
(ii) Stick the 500 toothpicks into the ground encompassed by the string. Make sure they are well mixed.

Activity

1. Discussion about birds finding food. Enlarge on insect eaters. What colour insects would be easiest to find in grass? Suppose the bugs were yellow, green, red, blue, and black--rank them from easiest to hardest to find. Tabulate results on board.
2. Divide your group into groups of 4-6. Name them cardinals, finches, etc. and send them out to their plot.
3. Give the group 5 minutes to locate as many of the 'insects' (coloured toothpicks) as they can without running their hand over the grass. Only looking and picking with the fingertips (beaks) is allowed.

4. Bring the 'insects' back into class and tabulate the total of each colour and the grand total for each group. Compile a master chart for all groups. Compare with earlier predictions.

PLANTS

1. Develop a way of making a survey of the different types and distribution of plants that grow in a field.
2. Record the differences in characteristics of five different kinds of coniferous or deciduous trees.
3. Find evidence of attacks by insects or disease on plants.
4. Find out as much as you can about a tree or shrub through the use of the five senses.
5. Find examples which illustrate some of the principles of how plants grow and function.
6. Observe the growth rings in a tree stump to determine how the environment has affected the tree through the years.
7. Compare the different methods that seeds use to travel from place to place.
8. Record the different vertical layers of plant life in a woods.
9. Study how plant growth is affected by light intensity.
10. Make a colour chart to find how many different colours and shades of the same colour you can find.
11. Compare the amount of the plant found above the ground level to that found below the ground level.
12. Compare the structure of the root systems from various kinds of plants and from the same kind of plant found in different locations.
13. Mark off quadrants of one square meter in different plant communities to compare the types of plants, amount of bare ground to that covered with vegetation, amount of basal area of each plant compared to the area covered by the foliage, light intensity, temperature of the air and soil, moisture present, soil compactness, water absorption rate, and air movement.
14. Determine if mosses and lichens grow more abundantly on the north side of trees or rocks.
15. Estimate the amount of water given off by a tree in one day through transpiration.
16. Estimate the ages of living trees without cutting them down.
17. Find evidence of how fire affects plant growth.
18. Find the nodules on the root systems of legumes. View the nitrogen fixing bacteria under a microscope.
19. Plan and plant a herb or vegetable garden.
20. Make a compost pile.
21. Find abandoned fields in various stages of succession and compare the types of vegetation found in each.
22. Find plants that have had various uses by man throughout history.
23. With a microscope, observe the cells in the leaf of a plant.

24. Compare the approximate amount of area covered by the tree and shrub canopies of different forest species.
25. Use identification keys to classify and find out the names of plants.
26. Note the species of trees and shrubs found in certain types of locations such as lowlands, high places, or wet places.
27. Determine if different species of trees leaf out, flower, fruit, or bud at the same time of year. Determine if the same species of tree in different locations leafs out, flowers, fruits or buds at the same time of year.
28. Note if different species of trees grow at the same rate throughout the year. Note if the same species of tree in different locations grow at the same rate.
29. Mark off a plot of trees and determine which should be cut and which should remain in a managed woodlot.
30. Determine how much maple sap it takes to make one cup of syrup.
31. Make a survey of the kinds of fruits and seeds and other plant parts that animals are eating.
32. Estimate how many seeds that have fallen from a plant have begun to grow. Estimate the total number of seeds formed by the plant.
33. Determine if the same kind of gall producing insect affects a certain kind of plant.
34. Make a brief dichotomous identification key for a selected number of trees based on leaf structure, bark, fruit, flower, or other characteristic.
35. Lay out a nature trail for the purpose of plant interpretation.
36. Plant trees and shrubs for purposes of erosion control, beautification, windbreak, or wildlife food and cover.
37. Prune and selective cut trees.
38. Estimate the number of trees in an acre of land.
39. Pinpoint a mythical forest fire from two points along a base line of known length.
40. Measure the number of board feet of lumber in a standing tree and determine its commercial value.
41. Compare the relationship between tree circumference and diameter.
42. Compare different methods of finding tree height for accuracy and ease of computation.

ANIMALS

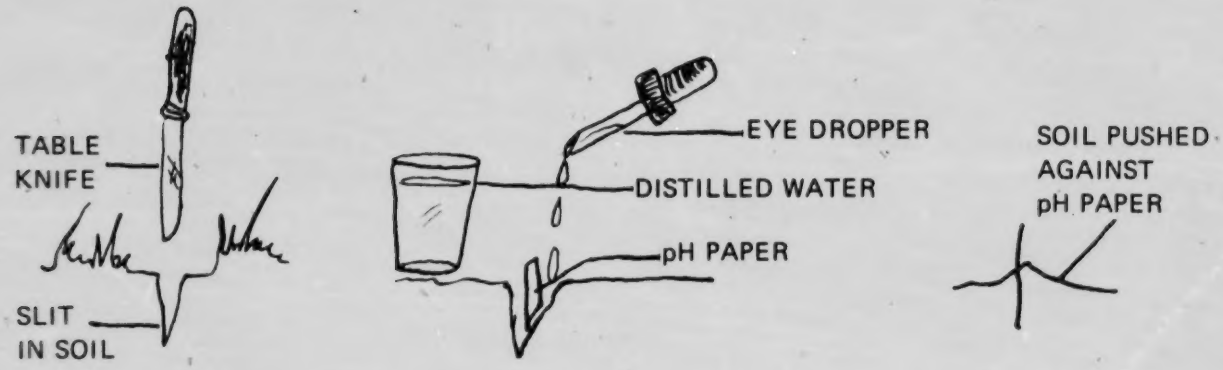
1. Compare the various kinds of animal tracks to note the number of toes or hoofs on the front and hind feet, the size of the track, the length and pattern of steps, and other clues to the habits of the animal.
2. Observe the behaviour of animals such as ants or beetles, and note the methods of locomotion, other movements, reaction to heat, light, moisture, and touch.
3. Determine if grasshoppers and other jumping insects jump in the same direction when touched.
4. Compare the number and kind of animals found in a square foot of soil dug to a depth of six inches to the animals found in plots located in different places.
5. Make an analysis of materials found in nests and other protective shelters used by animals.
6. Trace an earthworm's burrow by digging in the soil.
7. Make a population census of small animals found in an area.

8. Note the animals and animal evidences found in the different vertical layers of vegetation in the forest.
9. Note the animals found in the different states of dead and decaying trees.
10. Record the type and number of birds visiting a feeding station.
11. On a vegetation map of an area, record where the most varieties of wildlife evidence are found.
12. Determine the diet of animals by examining their droppings.
13. Identify birds and their locations to determine if they prefer certain habitats.
14. Compare the size of birds to that of the crow, robin, and English sparrow.
15. Record the most striking colours on various birds when they are perched or flying.
16. Observe and describe the behaviour of birds.
17. Estimate the number of birds in a flock.
18. Record the bird's flight pattern.
19. Describe the bird's song or call note.
20. Describe the bird's beak and determine how it is useful in obtaining food.
21. Observe how young birds are fed and cared for. Observe the colours of the plumage of the young birds.
22. Obtain a wing feather and make a sketch of its structure.
23. Describe the feet of the bird and determine how they are useful to the bird.
24. Make a survey of insects and the plants on which their evidences are found. Estimate the total number of certain kinds of insects in an area.
25. Attempt to find the sources of pollen observed on bees.
26. Develop a dichotomous identification key for a selected number of insects or other animals found.
27. Layout a nature trail for the purpose of animal interpretation.
28. Make brush piles to provide animal food and cover.
29. Determine different speeds of locomotion of ants, other animals, or of the students in the class.
30. Determine if the position of the sun has an effect on the navigation ability of certain insects.

1. How are soils classified by pH?

(a) Testing for pH in the field:

Have the pupils make use of a trowel to make a small slit in the soil to be tested right in the ground. Place a small piece of pH paper in the slit. Moisten the soil and the pH paper with a few drops of distilled water from a pill vial. Close the slit by pushing the soil around the pH paper. After a few minutes remove the pH paper from the soil and compare its colour with the chart on the pH box. Distilled water can be purchased very inexpensively from a drugstore. Both distilled water and pH paper could be obtained from a nearby secondary school.



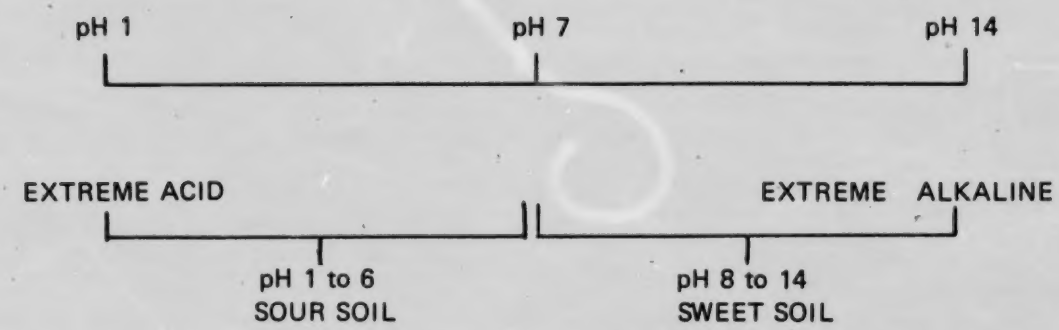
A. B. C.

(b) In the classroom:

Have the pupils bring back samples of the soil they wish to test in plastic baggies.

Teacher Background

pH is an abritrary scale which runs from number one to fourteen. The number indicates to what degree the limes found in soils balance the acidity or alkalinity of the soil. Most agricultural soils have a pH between number five and number eight. A good soil in which to grow most plants has a pH of number six.



pH paper can be obtained from:

Science Borealis Co. Ltd.
1820 Mattawa Avenue
COOKSVILLE' Ontario

Ask for pH test paper booklets:

pH 1 to 11 by Johnsons' of Hendon Ltd.
-- 6 test booklets per box
cost -- $1.00

2. How is the presence of chemical nutrients defected in the soil?

Have the pupils obtain a soil testing kit by writing for either or both of the items listed below:

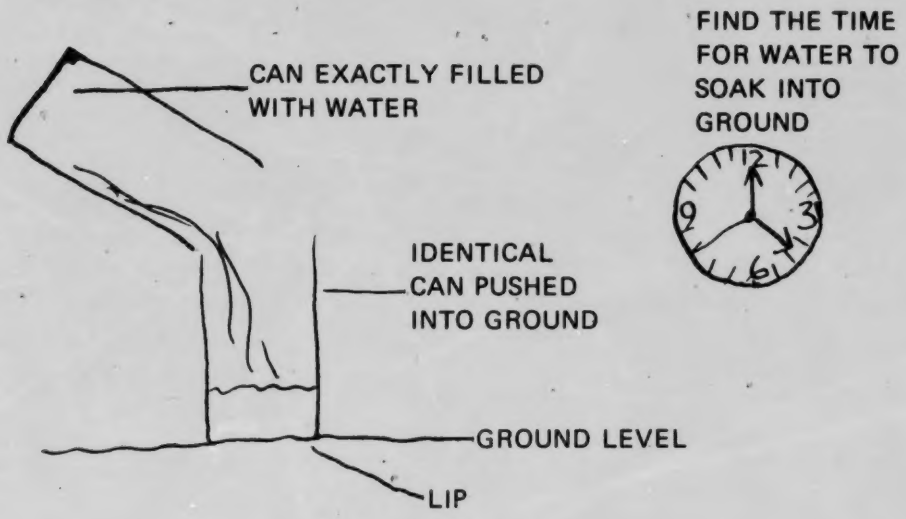
(a) Valley Soil Test Kit --Cost $2.00
Hillcrest Laboratories Inc.
Spring Valley
New York, U.S.A.

(b) Soil Test Kit --Cost $2.00
Arnold-Nasco Limited
58 Dawson Road
Guelph, Ontario

Instructions come with each kit which tell the pupils how to use the indicators to find the amount of potash, nitrogen and phosphorous in the soil being tested.

3. How can the permeability of the soil be tested?

Have the pupils remove both ends from a juice tin or pop can. Insert the can into the soil to be tested so that the lower lip is just covered by the soil. Pour exactly one canful of water from an identical can into the can inserted in the soil. Use a watch to measure the time taken for the water to soak into the ground. Repeat the activity in different places in the immediate vicinity of the first test and then taken an average of the times recorded. This activity should be performed out-of-doors.


CAN EXACTLY FILLED WITH WATER
FIND THE TIME FOR WATER TO SOAK INTO GROUND
IDENTICAL CAN PUSHED INTO GROUND
GROUND LEVEL
LIP

Teacher Background

The more porous the soil, the larger the air spaces and the faster the water will soak into the ground.

4. How can soil be examined with different types of magnifiers?

(a) In the field:

Be sure that the pupils know the skill of using a hand lens.

(see Patterns for the Teaching of Science by N.B. Massey, pp. 84-85)

The pupils probably can't take microscopes with them out into the field so they will need hand lenses (an excellent magnifying glass of -6 to -3 power can be obtained from MacAlaster Scientific Co. for approximately 35¢).

By examining various soils with hand lenses they should be able to observe and record shapes of particles and other substances found in the soil. Pupil records could show the number of the sample examined, the power of the magnifier used, the date and possibly a sketch of the features observed in the sample.

(b) In the classroom:

Have the pupils start by making dry mounts. Simply place some of the soil sample on a microscope slide and view it with the low power of a microscope with reflecting light.

Next add water and go to higher powers if necessary.

The pupils could make such comparisons as -- Clay as a powder with little or no spaces while sand has large spaces which the water fills. This information could be related to the porosity and hardness tests.

5. How can the size of the particles in various soils be measured?

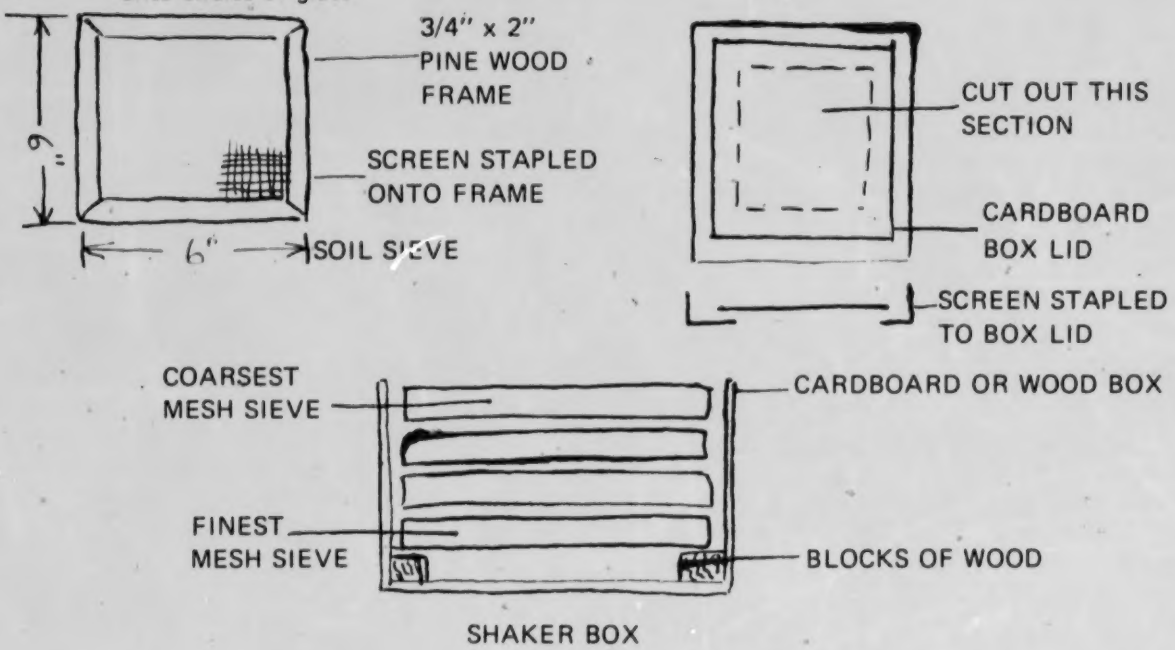
Have the pupils make soil sieves using the lids or cardboard boxes or pieces of wood for the frames and covering them with different sizes of meshes, i.e. the very fine mesh of a nylon stocking, several sizes of window screening, and hardware cloth with small openings for a coarse mesh.

The frames should all be the same size so that they will stack on top of each other and fit snugly into another box.

A commercial set of plastic soil sieves can be purchased from MacAlaster Scientific Co. for approximately $5.00. The sizes of screen openings used in these sieves range from 2.47 mm., .86mm., .38 mm. to .14 mm.

Place the soil sieves in the shaker box in order that the finest mesh is on the bottom and the coarsest is on the top. Put some of the soil sample on the uppermost sieve. Place a lid on the box and shake carefully. Remove each sieve and compare the relative number and size of the particles which have been separated out. One soil type can have particles ranging in size from powder to chunks.

The pupils could record these data by pouring the particles from each screen size onto circles of glue.



SOIL TYPE	SIZE OF PARTICLES		
	FINE	MEDIUM	COARSE
SILT LOAM CLAY LOAM MEDIUM LOAM SAND SANDY LOAM			

CIRCLES OF GLUE TO HOLD PARTICLES FROM SIEVE

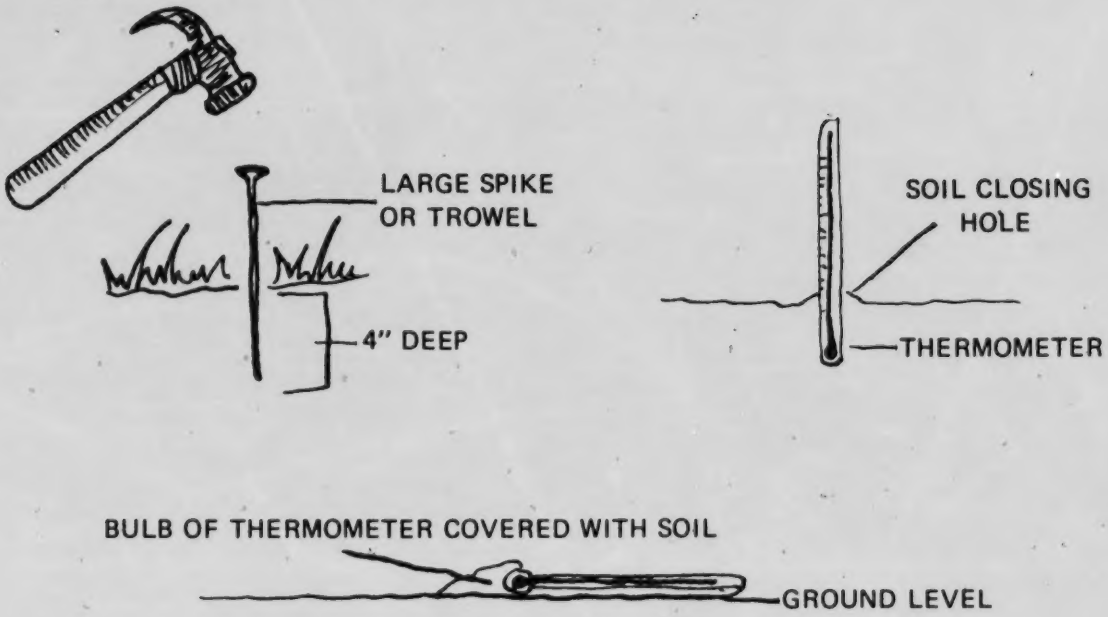
PUPIL RECORD CHART

6. How can the temperature of various types of soil be measured?

This activity will probably have to be conducted out-of-doors.

(a) Have the pupils use large spikes and hammer to make several holes approximately four inches deep in the soil plots they wish to test. Insert the bulb end of an immersion type thermometer (red reading 12" thermometer -10 to 120° can be obtained from Science Borealis Co. for approximately 70c). Pack a small amount of the soil loosely around the thermometer at ground level to stop air, which might be of a different temperature than the soil, from getting into the soil. Wait for several minutes before reading the thermometer. An average of several readings should be taken. The same holes can't be used a second time because of the influence of air temperature.

(b) To take the surface temperature of the soil have the pupils place the thermometers on the ground and brush a thin layer of soil over the bulb. Care should be taken to select areas which are level, clear of vegetation and other factors which might influence temperatures, i.e. shade. Temperatures should be taken as simultaneously as possible for each type of soil tested.



7. How can soil samples be obtained without digging a pit?

Use a soil auger to remove samples at six-inch intervals. Place the samples in bottles or paper cups. Test each specimen for:

(a) pH

(b) potash, nitrogen and phosphorous content

(c) porosity

(d) appearance under a microscope (use Blister Microscope)

(e) weight of a fully-packed two ounce cup

What other tests could be run on these samples?

DATA SHEET -- WINTER STUDIES -- GRASSLAND TO WOODLAND

Location	Air Temperature Height						Soil Temp. 6 inch depth	Depth of Snow in Inches	Snow Temperature			Wind Direction	Wind Speed in m.p.h.	Air Temp 5 ft. High	Wind Chill Factor (use chart)	Light Intensity footcandles		Soil Profile Frost Level in Inches	Animals Seen or Signs of Animal Life Draw Diagram	Location Where Seen
	Surface	1 ft.	2 ft.	3 ft.	4 ft.	5 ft.			Snow Surface	Middle Area	Bottom of Snow					Surface	3 ft. High			
Ex.	30°	30°	29°	29°	28	28°	26°	4 inches	30°	32°	30°	N.W.	6	28°	20°	60	40	8 inches	crow tracks	woods grassland
1.																				
2.																				
3.																				
4.																				
5.																				

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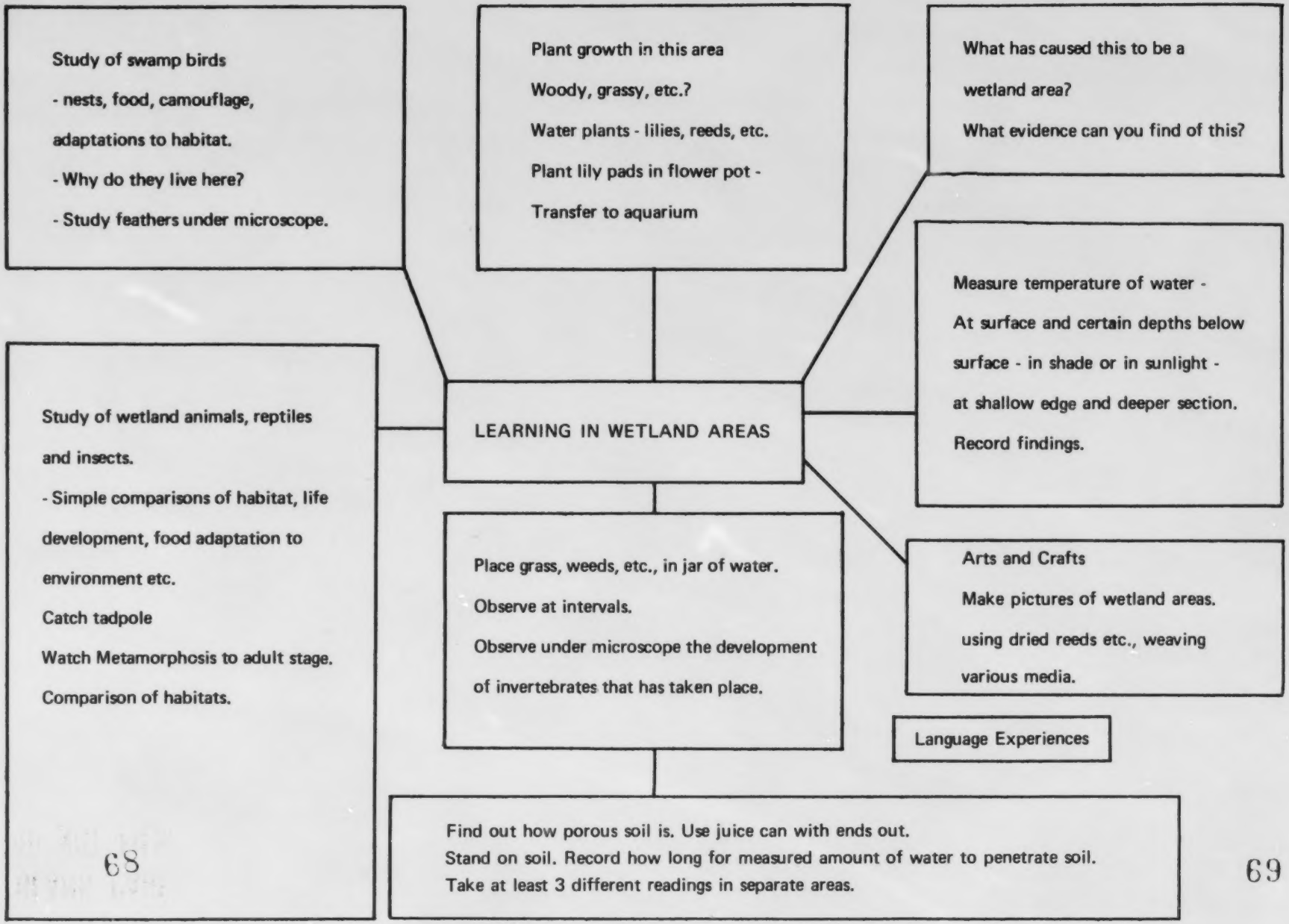

Study of swamp birds
- nests, food, camouflage,
adaptations to habitat.
- Why do they live here?
- Study feathers under microscope.
Plant growth in this area
Woody, grassy, etc.?
Water plants - lilies, reeds, etc.
Plant lily pads in flower pot -
Transfer to aquarium
What has caused this to be a
wetland area?
What evidence can you find of this?
Measure temperature of water -
At surface and certain depths below
surface - in shade or in sunlight -
at shallow edge and deeper section.
Record findings.
Study of wetland animals, reptiles
and insects.
- Simple comparisons of habitat, life
development, food adaptation to
environment etc.
Catch tadpole
Watch Metamorphosis to adult stage.
Comparison of habitats.
LEARNING IN WETLAND AREAS
Place grass, weeds, etc., in jar of water.
Observe at intervals.
Observe under microscope the development
of invertebrates that has taken place.
Arts and Crafts
Make pictures of wetland areas.
using dried reeds etc., weaving
various media.
Language Experiences
Find out how porous soil is. Use juice can with ends out.
Stand on soil. Record how long for measured amount of water to penetrate soil.
Take at least 3 different readings in separate areas.

ANIMAL LIFE IN THE WATER (MUD)

AREA _____

DATE _____

YOUR SCHOOL _____

NAMES _____

_____

_____

Purpose: To study the types, characteristics and location of animals found in a marshland area.

Equipment: dip net, 12 plastic vials, masking tape, plastic pail, 3 kitchen strainers, 2 insect nets, 1-18 inch ruler, clipboard, pencils, 3 aluminum pie plates.

Instructions:

1. Working in the area between the 2 transect lines and in the water area carry out the following studies of animal life. Be sure to remove only ONE EXAMPLE of any animal type.
2. Collect a sample of water near the shore, partway out and about 25 feet out to get samples of small microscopic life in the water from different areas. Keep these samples in pill vials and take them back to the centre to examine under the microscope.
3. Using the insect nets, sweep across the plants in the water and try to catch the insects flying there. Note the size, colour, number of body parts, legs, wings and name of the insects caught. Draw a picture of the animal caught and then let it go.
4. Using the dip nets and the kitchen strainers collect animal life which is found on the surface of the water and in the water. Note the location, size, name, body parts, legs, wings of those creatures caught. Place some of the samples of water animals in the aluminum pie plates in order to look at them more closely.

NOTE: Draw the sketches of animals seen on the back of the data sheet.

5. Remember that an animal is any living thing which is:
   (a) able to move
   (b) reproduces by eggs or live birth (usually)
   (c) utilizes oxygen from air or water
   (d) eats food rather than produces it
6. Secure one end of the transect line to the shore pole of the plant study group and stretch the line out for a distance of 50 ft. parallel to the shoreline. Examine the area between these lines and the shoreline for signs of animal life.

Large Animals

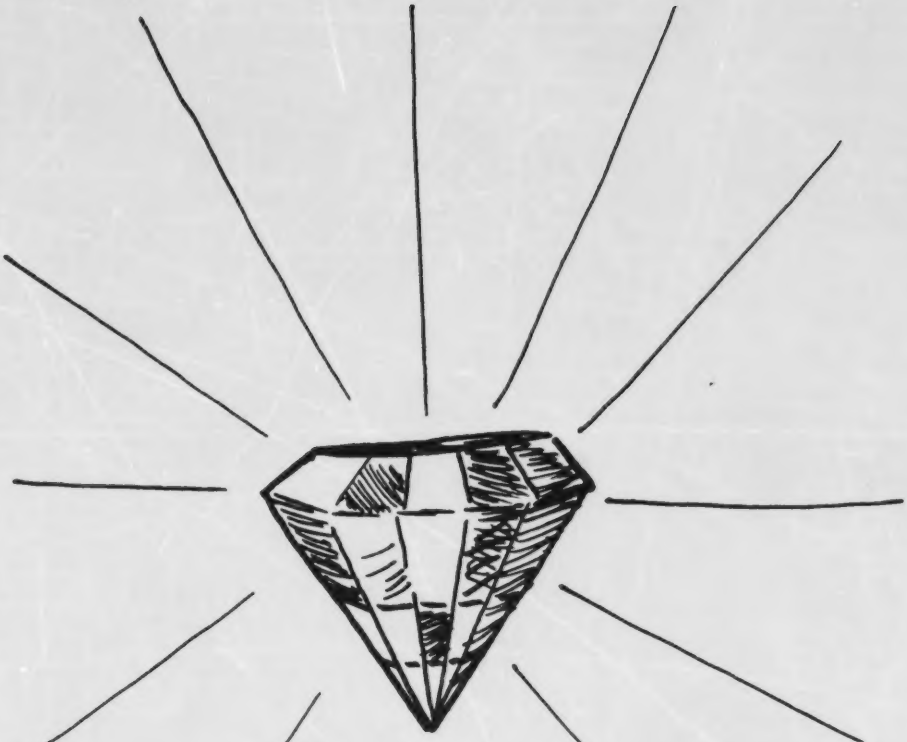
7. Note any large animal seen (mammal, bird, reptile, amphibian). Record its colour, size (approximate), habitat (where found), special features, numbers of each type of animal. Look for signs of animal activity such as animal runways, food cuttings, gnawings, claw marks, footprints, nests, tunnels, holes.

Small Animals

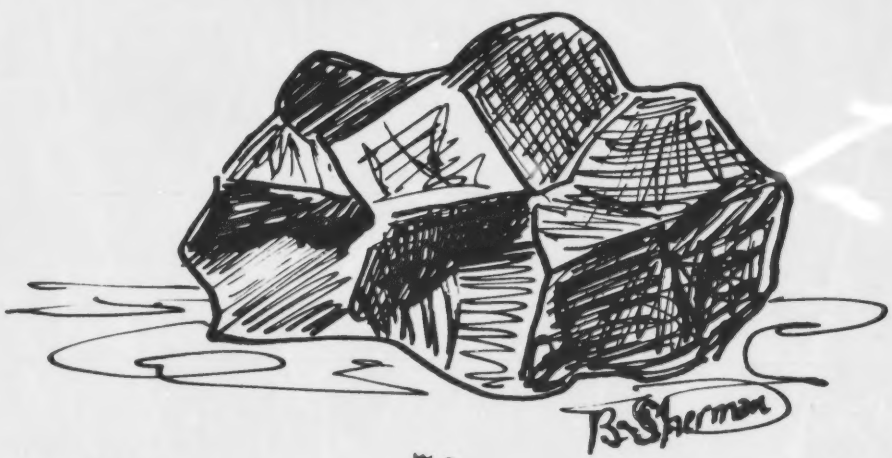
8. (a) Note small animals (insects--moths, butterflies, ants, spiders, snails, worms, etc.). There will be so many of these that you will be able to record only some. Be sure to look over the entire area. Some may be found by removing the top three or four inches of soil with the trowel and carefully sifting through it. Look under rocks, logs, but be sure to put these objects back exactly where you found them.

   (b) Sketch each animal type that is seen. Note the colour, number of body parts, number of legs, evidence of wings, and the location within the area where the animal was found.

MINERALS



ROCKS



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GEOLOGY

1. Determine how many different kinds of fossils can be found and develop a simple method of classifying them.
2. Find examples of how rock and man-made stone are used by man.
3. Develop method of measuring soil erosion in different places.
4. Determine effective methods for preventing and checking soil erosion.
5. Determine how many different kinds of soil can be found and classify them according to their characteristics.
6. Compare the rates of water absorption into the ground in different locations.
7. Determine the water holding capacity of different soils.
8. Compare rocks according to colour, colour streak, texture, hardness, luster, fabric, fracture, density and other characteristics.
9. Compare the weathered surface of a rock to a freshly broken surface.
10. Determine the dip and strike of a rock outcrop.
11. Find examples of ripple marks, faulting, and folding in rocks.
12. Using a geologic map of the area, find various kinds of exposed rock formations.
13. Classify the soil fractions according to size of particles and type of content. Determine the percentage of each soil fraction present.
14. Compare the relative soil compactness in different places.
15. Compare the effects of soil colour and vegetation coverage on the soil temperature.
16. Compare the amounts of organic matter present in different soil samples.
17. Compare soil acidity and alkalinity and the amounts of potassium, phosophorous, and nitrogen in different places.
18. After a rain, compare the amounts of soil erosion in different places.
19. Compare the relative amounts of air contained in different soil samples.
20. Compare the depth of the topsoil in different locations.
21. Compare soil profiles in different locations.
22. Classify the land according to the Soil Conservation Service's eight Classifications.
23. Determine angles of crossbedding in sandstone rock.

GEOLOGY

Areas for study out-of-doors, in the Leeds and Grenville area.

Information

Leeds and Grenville counties are partly in the Precambrian Shield and partly in the St. Lawrence Lowlands. In Precambrian time, about 1 billion years ago, the southern area of the Canadian shield was extensively metamorphosed over an area about 200 miles wide and parallel to the St. Lawrence River. This section of the Precambrian Canadian Shield is called the Grenville Province, and can be traced from Georgian Bay to Labrador. It is believed that this area at that time (1 billion years ago) was a mountain range much like the rockies of to-day. Since that time erosion has removed some tens of thousands of feet of Sedimentary rock to expose the roots of a mountain range. One offshoot of this linear range crosses the St. Lawrence between Kingston and Brockville, to form the

thousand islands. This offshoot, called the Frontenac axis, terminates in the Adirondacks of Northern New York.

About 600 to 500 million years ago, a sea invaded North America in our area, depositing hundreds of feet of limestone. At the base of this limestone and above the Precambrian basement rock, a few feet (0' - 30') of conglomerate may be found. This is exposed immediately west of the Scenic Route on Highway 401, and in pasture land immediately north of the 2nd concession, about 1/2 mile east of North Augusta Road (at the top of the hill). This basal conglomerate demarks a major unconformity.

A few fossils may be found in the nearly horizontal limestone strata. The surface of the limestone is striated in many places. These striae indicate glacial movement to be from 10° - 20° E. of North. The centre of glaciation, therefore, was the Labrador ice sheet. The best striae can be photographed in the Limestone at the intersection of Highway 401 and the Maitland Road. This glacier was responsible for many of the recent deposits, especially the areas of gravel. These till deposits were laid down within the last 1 million years. The glacier that covered our part of the world at this time depressed the land surface approximately 300', so that after retreat, sea water invaded our land up to the edge of the Frontenac axis. This sea (Champlain Sea) covered much of our area to a depth of 60'. Erosion in this sea left a layer of sand over much of our area. Animals that lived in this sea include many small marine snails. These may be picked up as fossils in a gravel pit immediately West of Highway 16, opposite the Pittston side road (Concession 5). As land rebounded, the sea was forced farther south and eventually from North America. This left a desert - like environment covering much of the area. Our land surface was blown for a short period of time into numerous sand dunes. Also linear sand bars appear as ridges on our landscape. The surface was quickly covered with vegetation and subsequent rainfall runs off mostly to the N.E. indicating a watershed within 2 or 3 miles North of the St. Lawrence R. These rivers can be used to show a study of recent geological erosion and deposition.

Suggested Activities

A: Stream
- (1) Measure flow of a stream
- (2) Measure sediments in stream (amount and type)
- (3) Note areas of deposition of stream
- (4) Note rill formation on bare slopes
- (5) Note colour differences and amount of sediments after a rain compared to no rain.
- (6) Determine effective methods for preventing and checking soil erosion.

B: Glaciation
- (1) Measure striae on bedrock
- (2) Note polishing
- (3) Visit potholes, describe formation
- (4) Visit gravel pit and note rock types, count pebbles in a certain area, calculate the percentage. From this one can calculate the distance most particles are moved by glaciers.
- (5) Count and examine erratics, will give same results as (4)

C: Visit to a Limestone Quarry
(1) Note strata, how much sediment would be deposited per year?
How much compaction of mud produces how much limestone?
(2) Collect and identify as many fossils as can be found
(3) Look for minerals in rock, as many fossils are replaced by minerals.
(4) Why does water occur in most quarries?
(5) Why are strata almost horizontal?
(6) What names are applied to warped sedimentary strata?

D: Visit Sand Dune (Limerick Forest)
(1) Sketch shape
(2) What direction is the prevailing wind?
(3) Measure the height of the dune
(4) Examine sand grains under microscope
(What is meant by frosting of sand grains?)
(What is the shape of wind-blown sand grains?)
(5) What steps can be taken to slow the shifting sands?

E: Minerals
Visit to Avery's Farm, Halleck's Sideroad. Obtain permission ahead of time. Back through fields and across the stream, one can find quartz crystals, wollastonite. North of Lansdowne or South of Lyndhurst a number of marble locations, one can find calcite crystals.
Manganite dentrites, chalcopyrite, calcite and some zeolites have been found in Brundridges Pit (N. of 3rd concession about 1 mile E. of Maitland Road). Pyrite at Ivy Lea Bridge at road cut under scenic route.

F: Fossils
Well-developed fossils are scarce in this area. Recent shells may be found in gravel pit opposite Pittston Road between old and new Highway 16. Cephlapod fossils, badly worn may be found in Brundridges Pit (N.W. corner). Also algal concretions may be found here (S.E. corner).

G: Igneous Rocks
St. Lawrence Park shows a good granite stock. Some diabase is also found here. Excellent diabase dykes, about 3' - 5' wide may be found north of Ivy Lea Bridge and on the access road to 401 (i.e. between scenic route and 401).
"Lit par lit" ingection gneiss may be used as examples of pegmatite dykes and sills. These are well developed along the scenic route, just west of Mallorytown Landing.

H: Metamorphic Rock
Gneiss is well developed west of Mallorytown Landing. North of Lansdowne and south of Lyndhurst a number of marble locations may be found. Some quartzite locations are found, e.g. North of 2nd Concession and on the rise immediately east of the North Augusta Road. (Get permission before entering the field.)

I: Sedimentary Rocks
Any limestone quarry, e.g. Brundridges' Pit North of 3rd Concession about 1 mile East of Maitland Road.

J: Structure
- measure altitude (dip and strike) of rock layers, foliation, etc.
- examine mud cracks, ripple marks, faulting, folding, crossbedding.

K: Uses

Find examples of how rock and man-made stone are used by man.

Exercises:

1. Determine different kinds of soil and classify them according to their characteristics.
2. Compare rates of water absorption into the ground in different locations.
3. Determine water-holding capacity of different soils.

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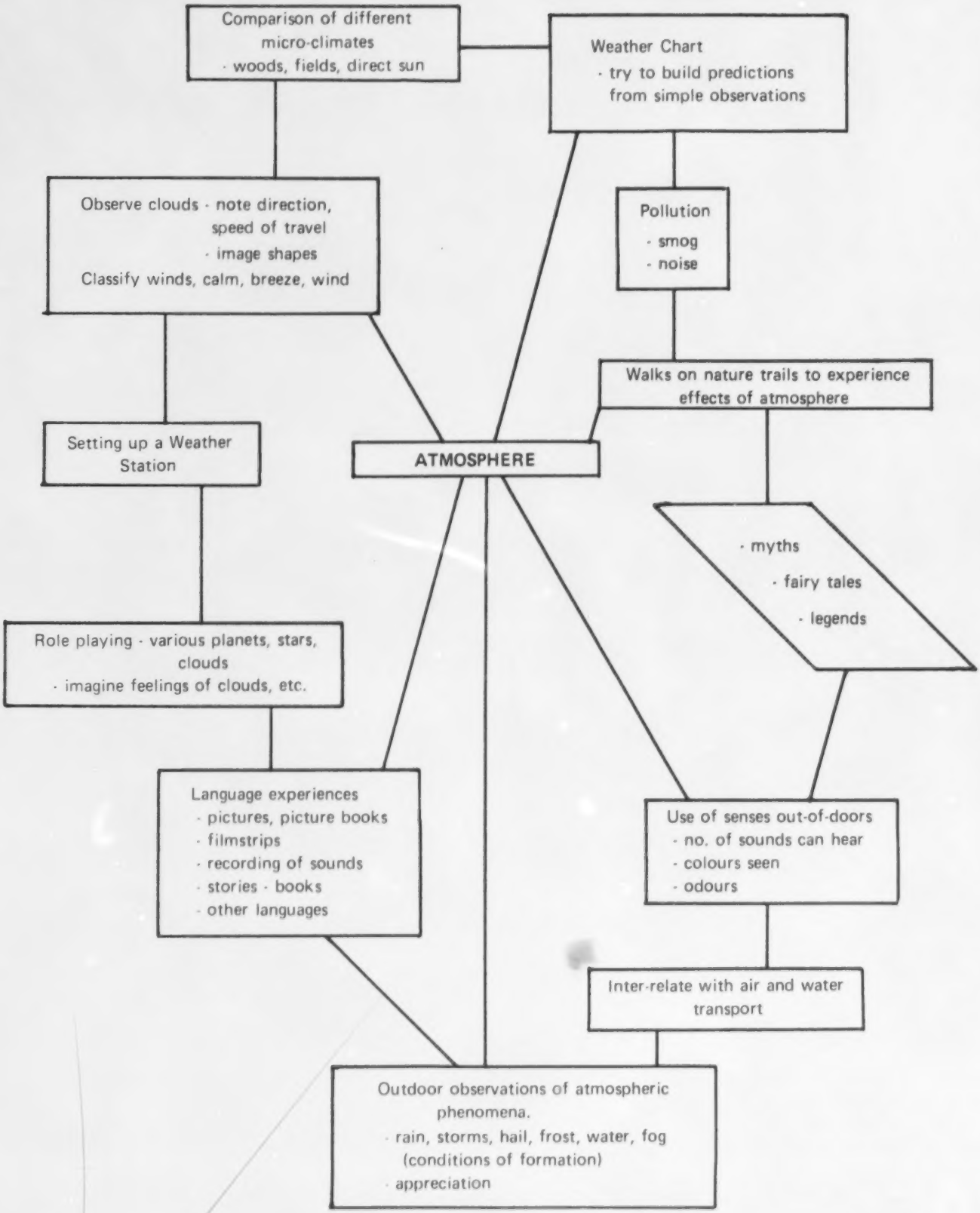

Comparison of different micro-climates
· woods, fields, direct sun
Weather Chart
· try to build predictions from simple observations
Observe clouds · note direction, speed of travel
· image shapes
Classify winds, calm, breeze, wind
Pollution
· smog
· noise
Walks on nature trails to experience effects of atmosphere
Setting up a Weather Station
ATMOSPHERE
· myths
· fairy tales
· legends
Role playing · various planets, stars, clouds
· imagine feelings of clouds, etc.
Language experiences
· pictures, picture books
· filmstrips
· recording of sounds
· stories · books
· other languages
Use of senses out-of-doors
· no. of sounds can hear
· colours seen
· odours
Inter-relate with air and water transport
Outdoor observations of atmospheric phenomena.
· rain, storms, hail, frost, water, fog (conditions of formation)
· appreciation

MAKING USE OF A WEATHER MAP

Now let's see some of the things that go into making a weather map... Most of you are familiar with the word weather front as drawn on the TV map by Percy Saltzman, but it might be a good idea to analyze a front and see what we mean by it... Definition... A front is a line (wall or surface) separating different kinds of air...by different kinds of air we mean a difference in temperature and in moisture content and if I draw a front on a map, the air on one side must be substantially different from that on the other side.

Suppose we should think of what should happen near a warm front. You are all familiar with the idea of air moving up the side of a mountain and becoming cooled as it rises, giving first cloud and eventually rain (or snow). That is exactly what happens on a warm front ... The mountain is a mountain of cool air which acts as a block, forcing the warmer, lighter air to be blown up the slope and as before it produces cloud and eventually rain. The chief difference between a frontal surface and a mountain is that the mountain of cold air tends to keep moving away and so the cloud and rain move along with it. When the warm front approaches a station the first indication is (as in diagram and model) thin wispy cirrus cloud which gradually thickens into mackerel sky of cirrocumulus with cirrostratus and eventually altostratus and altocumulus and then finally into rain clouds. Then as the warm front passes, the rain stops, the temperature rises and you may get clearing skies.

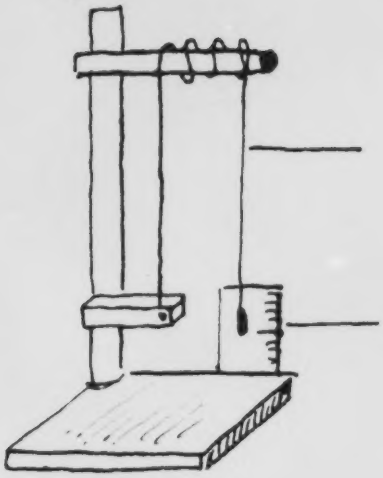
	Ahead of Warm Front	Behind Warm Front	Behind Cold Front
Temperature	Cool	Warm	Cold
Wind	E to SE	SSW	WNW to N
Barometer	Falling	Steady or falling slightly	Rising strongly
Weather	Increasing Cloud then rain	Fair to partly cloudy chance sctd. showers	Rain ends, clouds break up & gradually clear

Cold Front - same as warm front only the weather zone is narrower and more active with better clearing behind. The warm air if lifted by wedge action this time. A warm front might stall but the cold front has to move with the speed of the wind that is pushing it.

WEATHER (General Activities)

1. Determine if the temperature of the air varies in different places. Determine some of the factors which may cause these differences.
2. Design and make simple devices to measure the relative wind velocity and direction in different places and at different elevations.
3. Devise a way of measuring the evaporation rate of water in different locations.
4. Find examples of weathering of natural and man-made rock.
5. Compare the different cloud types and estimate their elevation.
6. Determine the speed and direction of moving clouds.

7. Attempt to discover evidence of air pollution.
8. Compare the relative humidity in different places and at different times of the day.
9. Find the air pressure at different elevations and at the same elevation during different times of the day.
10. Compare the amounts of radiation absorption in differently coloured materials.
11. Determine the temperature by using the chirps of a cricket.
12. Make weather forecasts based upon the readings of weather instruments.
13. Observe and compare the six basic shapes of snowflakes.
14. Compare the various depths of snow in different places and determine the reasons for these differences.
15. Record and compare the temperatures of the air, soil, and snow at different depths.
16. Determine the amount of water in a cubic foot of snow and calculate the ratio of air to water.
17. Evaporate some snow and observe the residue.
18. Observe the affects of rock salt on snow.
19. Observe a cross-section of accumulated snow and compare it to the formation of certain types of rock.
20. Determine the acidity or alkalinity of melted snow or rain.
21. Compare the amount and texture of melting snow on a north-facing slope to that on a south-facing slope.
22. Determine how much water will be accumulated for a specific amount of precipitation falling on a roof.
23. Determine how far away a thunderstorm is with the aid of thunder and lightning.



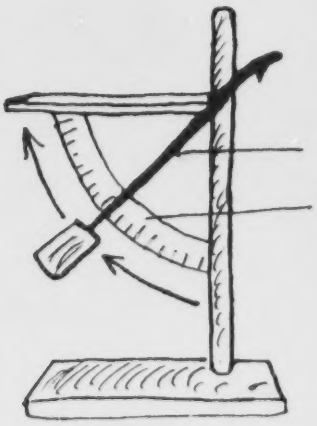
SIMPLE INSTRUMENTS YOU CAN BUILD

A SIMPLE HAIR HYGROMETER

Make a hair hygrometer using a clean long hair. Set is up as shown on the diagram. If the weather is dry, the hair will shorten, and rasie the weight. If the air becomes humid, the hair will stretch, and the weight will lower.

THE WEATHER HOUSE

Make a house of cardboard as shown. Glue one end of a piece of catgut, or violin string, to a piece of cork fastened to the roof of the house. Connect lower end of catgut to platform with weather figures (one for rainy; one for sunny weather). Catgut will coil or uncoil according to the humidity of the air.



WIND SPEED INDICATOR

Construct a wind speed indicator as shown. Make sure the pointer is free to swing. The faster the wind blows, the higher the pointer will raise.

LIBRARY BOOKS HAVE LOTS OF GOOD IDEAS FOR OTHER INSTRUMENTS.

RAIN GAUGE

To measure the depth of rainfall, use a tall juice tin, and a foot ruler.

WEATHER: AIR PRESSURE

AIR PRESSURE

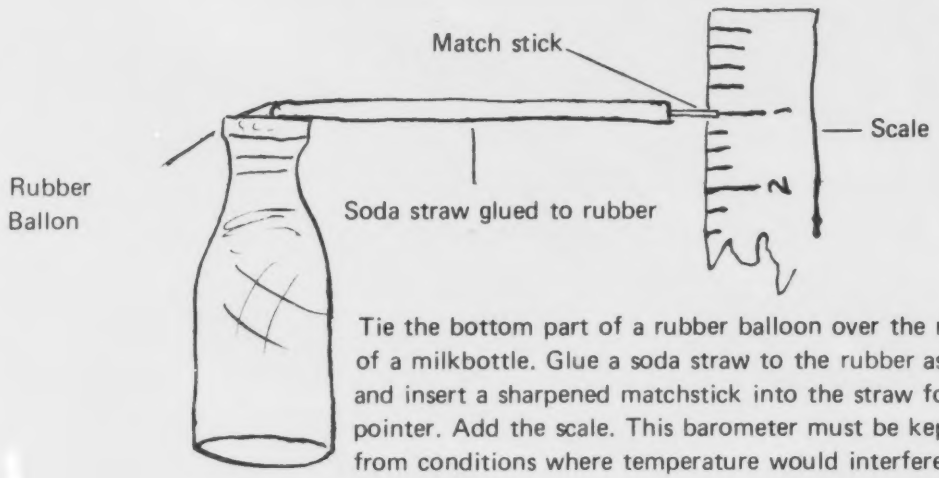
The blanket of air above us has weight. This entire weight presses on the surface of the earth due to gravity. The higher we go above sea level, the lighter the pressure. At sea level, we have almost 15 lbs. for every square inch pressing against us. This means an average-sized man has a pressure equal to 30,000 lbs. all over his body.

Air pressure affects the winds, temperatures, clouds, and rain, and so is a very important factor in understanding weather.

HOW TO MEASURE AIR PRESSURE

Air pressure is measured with a barometer. High pressure usually is found with good, clear, sunny weather; low pressure brings in dull, cloudy unsettled weather generally. A rising barometer usually means fair weather, while a falling barometer is likely to forecast unsettled and cloudy weather.

YOU CAN MAKE A SIMPLE BAROMETER LIKE THE ONE BELOW:



Tie the bottom part of a rubber balloon over the mouth of a milkbottle. Glue a soda straw to the rubber as shown, and insert a sharpened matchstick into the straw for a pointer. Add the scale. This barometer must be kept away from conditions where temperature would interfere with the reading.

FURTHER REFERENCE

1. When in the city, call to check your weather reports.

2. Build your own station at school, at home, or at the cottage. For information regarding the construction of simple yet accurate instruments, write to .....

   The Director,
   Department of Transport,
   Meterorological Branch,
   315 Bloor Street,
   TORONTO, Ontario

   Free classroom sets for the asking - all meteorological studies.

3. For a free booklet concerning the identification of the different clouds, write to . . .

   The Sun Life Assurance Company,
   218 Sun Life Building,
   Montreal, Quebec.

4.

Books	Publisher
Everybody's Weather	Lippincott
Weather	Golden Press
Weathercraft	Viking

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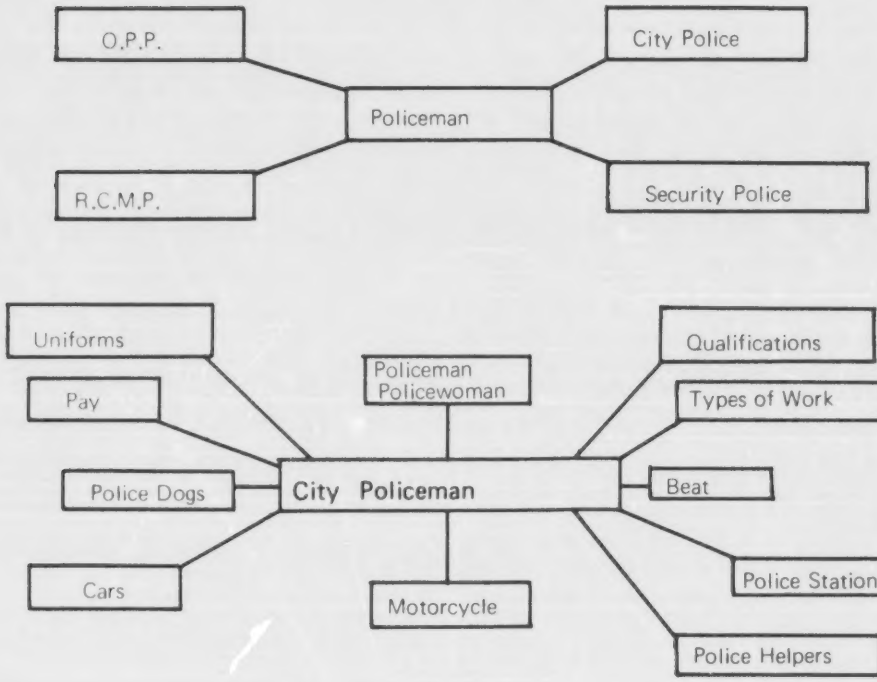
Community Helpers

COMMUNITY HELPERS

1. Take field trips to observe community services.
2. Walk - take a bus - to visit various community helpers
   - see at work
   - have in classroom
3. Descriptions of various workers and their jobs.
   - role playing
   - art - multi-media approach
   - language experiences
     picture
     recording — various media
     experience charts
     discussions
   - people who visit home, school
   - have them visit class
   - bus driver
4. Local Industries
5. Historical Landmarks
6. Parks

The POLICEMAN (Primary)



1. Trevor, the Safety Bug
2. Traffic Policeman
3. Police Uniforms
4. Qualifications for Police Work
5. Types of Police Work
6. Police work at night
7. Filmstrip: Our Police Department
8. Kinds of Policemen in our Community
9. Police around the World
10. Preparations for the Policeman's Visit or a Visit to the Police Station
11. Policeman's Visit or Visit to Police Station
12. Student's Role as Policeman's Helper

OBEY THE RULE

..... YOU're NO FOOL

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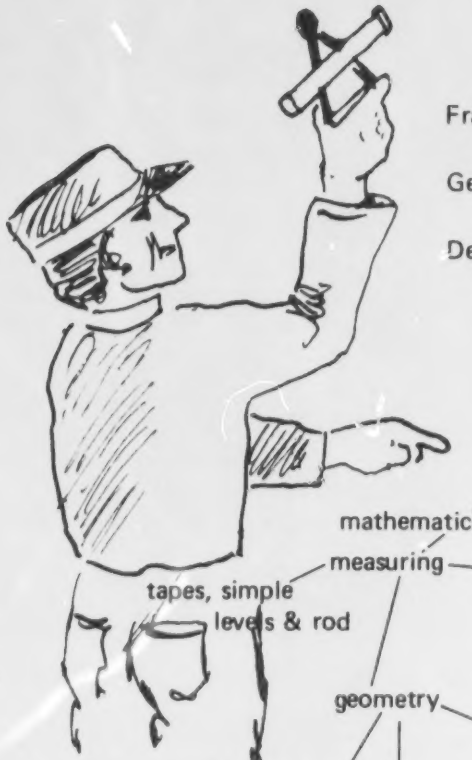
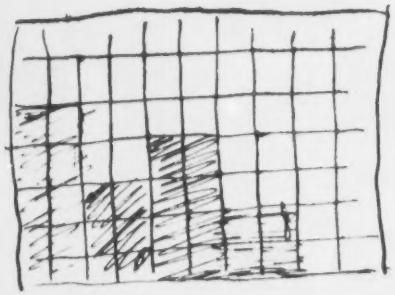


France

Germany

Denmark



MAP MAKING
WHOLE SITE ACTIVITY

Drama - based on early explorers
- navigation etc.

Arts based Learning Activities

colourful maps etc.

mathematics

measuring

compass work
units of measurement
addition subtraction, division etc.

tapes, simple levels & rod

geometry

pie & bar graphing etc.

percentage, ratios etc.

measurement of angles, formulae, application of formulae to determine height, distance & pos.

plotting & graphing

position of a map
river studies i.e. profiles, transects, top, maps, pond profiles and transects etc.

practical application
making a contour map with simple instruments from a given bench mark

positioning of profilestations with a compass, measuring & plotting on graph paper

mapping & plotting creek, stream, river or pond.

river study

vertical profile showing fall and profile of river

horizontal profiles on same grid - shows river bank features etc.

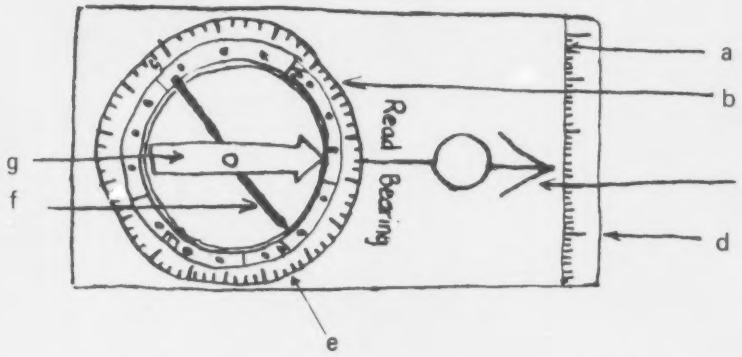
erosion, flooding, interrelationships of nature - water, plants, forces, rock rock formations etc.

Names_____

_____

_____

1. Name the parts of the compass that you are using



a._____
b._____
c._____
d._____
e._____
f._____
g._____

2. What are the 8 major directions or Cardinal and Intercardinal points?

3. Into how many segments is the compass circle divided?

   What is each segment called?

4. How many degrees are found at each of these directions?

   N_____ E_____ SE_____ NE_____

   SW_____ S_____ NW_____ W_____

5. How to take a Bearing on an Object

   Taking a bearing means to find out the number of degrees or the direction a particular object is from you. This direction is also known as the objects azimuth.

   Hold the compass horizontally and:

   (a) Aim the direction of the travel arrow at the object.

   (b) Turn the compass dial so that the orienteering needle points to 360° or N.

   (c) Read the number of degrees opposite the direction of the travel arrow.

ORIENTEERING

This is one of the most popular sports in the world and in many countries, a compulsory subject in schools. It is an intelligent form of cross country 'running' requiring an accurate knowledge of map and compass. These used in combination facilitate route finding, so much so that to get lost should be an offence.

It is necessary from the outset to develop confidence in the use of the compass and at this stage one would suggest a careful examination of the Silva Compass.

ORIENTEERING – COMPASS GAME

Equipment for Game

- a set of 20 stakes marked consecutively from 1 to 20 OR a 100 ft. string with tags on it at five-foot intervals marked from 1 to 20 (for this you need two stakes to attach the string to)
- a compass for every pupil or every two pupils
- the complete compass game including the answer card
- a tape measure for measuring the distances
- a one hundred foot base line to be used as a guide
- a hammer

Preparations

- lay out a magnetic west-east line on the ground and stretch the string along this line
- hammer in the numbered stakes along the line at 5 ft. intervals with the number 1, the most westerly marker and number 20 the most easterly

Activity

1. After the pupils have adjusted their step to either 2 or 2-1/2 ft., each pupil is given a game card that has three separate games and a compass.
2. They then proceed to the numbered stake that corresponds with their starting point on the card. They set their compass to the first bearing, stand behind the stake, figure out the number of steps to be taken, sight an object in the distance and walk.

3. When finished with the first bearing, they set their compass for the second and follow the procedures for direction and distance.
4. Complete the third part to the first game and then while standing where you finish, call for a teacher to have your score tallied. This is done by locating the correct destination and subtracting from 100 marks, one mark for each foot they are away from the marker.
5. Repeat the procedure for games two and three on the card and total your marks for all three. Your mark will be out of three hundred.
6. When everyone is finished, compare total scores to see if anyone had 300 or who was the closest.

CONTOUR MAPPING

Purpose: To measure and graph a cross section of a hill and/ or a ravine.

Equipment: clipboard, pencil, tape measure, compass, transect level, 2 transect poles.

Method:

1. Go to the location given to you by the teacher.
2. In the centre of the ravine, find the direction that the ravine is running, using the compass. Note either the cardinal direction or the number of degrees in each direction.
3. Take one transect pole and climb the ravine and push the pole into the ground at the ravine top so that the pole is at right angles (90°) to the ravine direction.
4. Stand in the centre of the ravine and hold the transect level so that the bubble indicates that it is level.
5. Sight through the sights at the bank of the ravine. Have someone walk up the hill and place the second transect pole so that the bottom of the pole is in line with the line of sight. Measure the distance from the top of the transect level to the base of the transect pole to the nearest foot.
6. Take the transect level to the position of the transect pole and level the bubble. Put the transect pole in line with the line of sight and measure the distance.
7. Repeat No. 5, 6 until you reach the top of the ravine where the first transect pole is.
8. Repeat the same procedure for the opposite slope of the ravine.

MAPPING A RAVINE

DATA SHEET

Slope A

Position	Distance	
	between positions	in feet
1	1 - 2	
2	2 - 3	
3	3 - 4	
4	4 - 5	
5	5 - 6	
6	6 - 7	
7	7 - 8	
8	8 - 9	
9	9 - 10	
10	10 - 11	
11	11 - 12	
12	12 - 13	
13	13 - 14	
14	14 - 15	
15	15 - 16	
16	16 - 17	
17	17 - 18	
18	18 - 19	
19	19 - 20	
20	20 - 21	

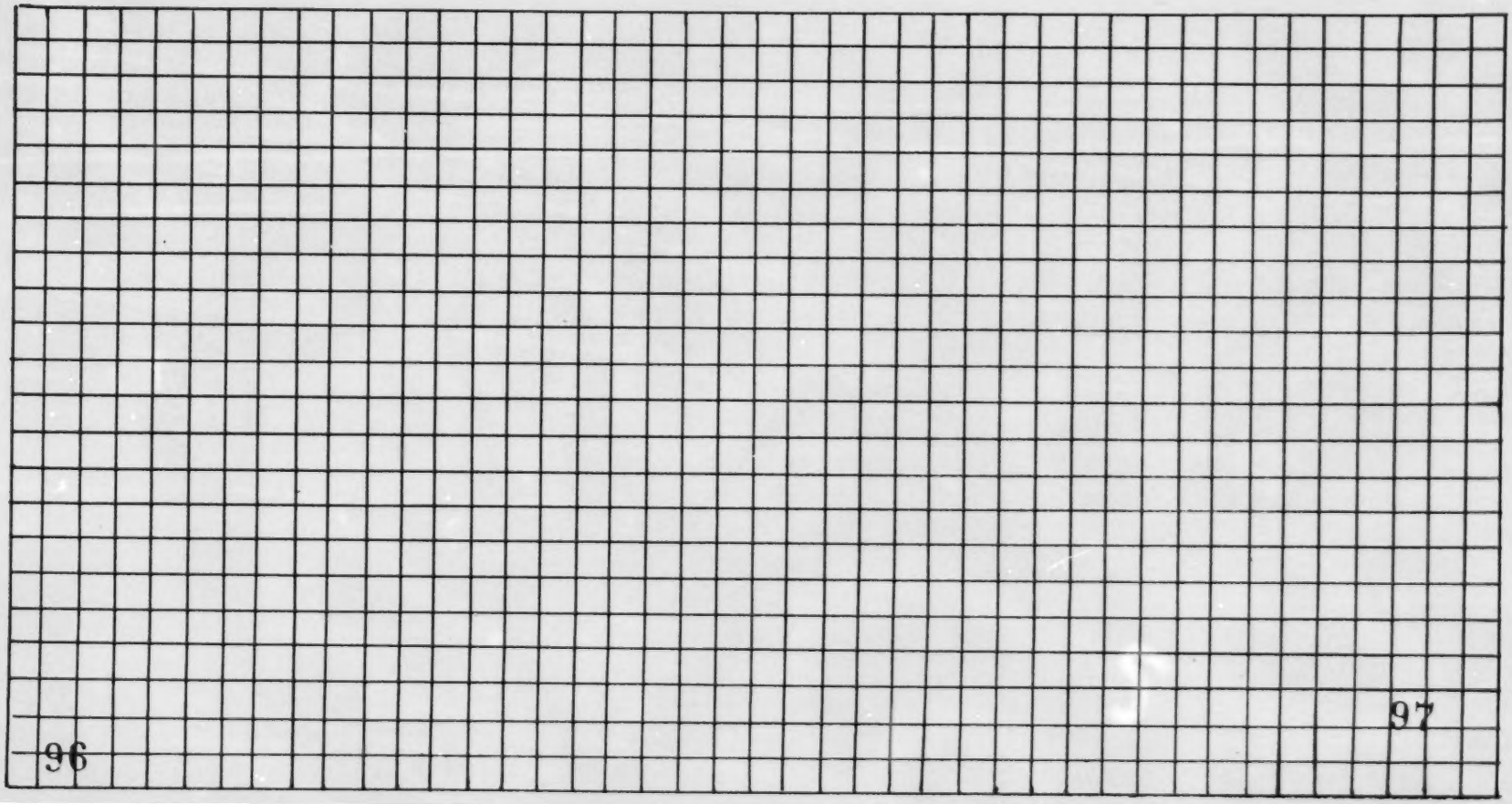
Slope B

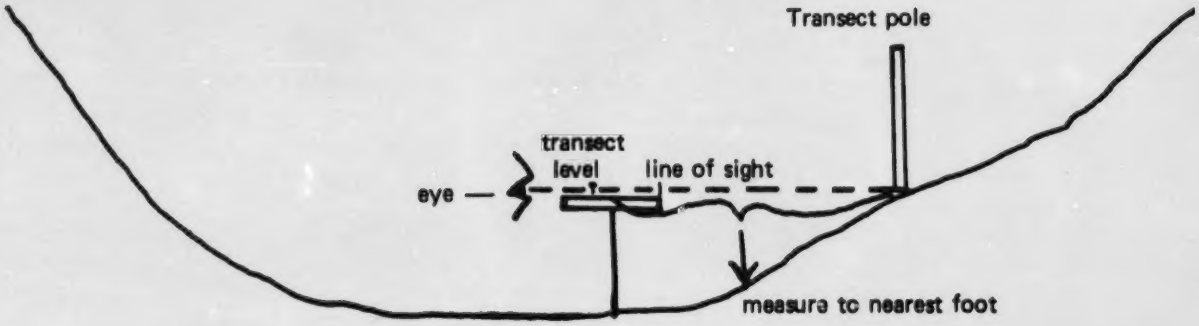
Position	Distance	
	between positions	in feet
1	1 - 2	
2	2 - 3	
3	3 - 4	
4	4 - 5	
5	5 - 6	
6	6 - 7	
7	7 - 8	
8	8 - 9	
9	9 - 10	
10	10 - 11	
11	11 - 12	
12	12 - 13	
13	13 - 14	
14	14 - 15	
15	15 - 16	
16	16 - 17	
17	17 - 18	
18	18 - 19	
19	19 - 20	
20	20 - 21	

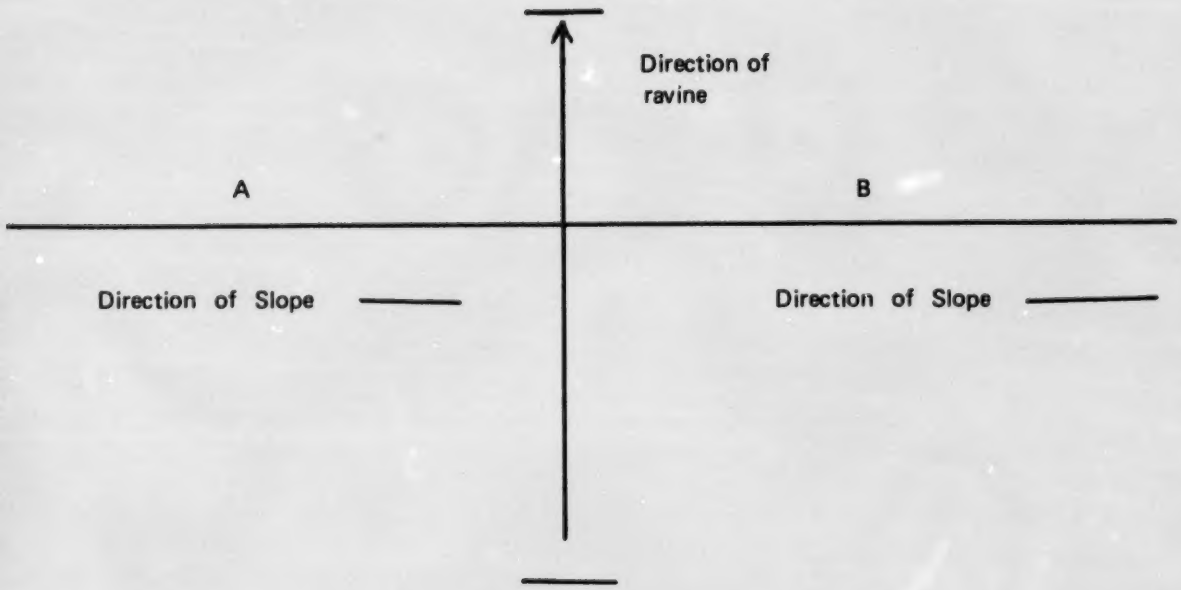
MAPPING A RAVINE WORKSHEET

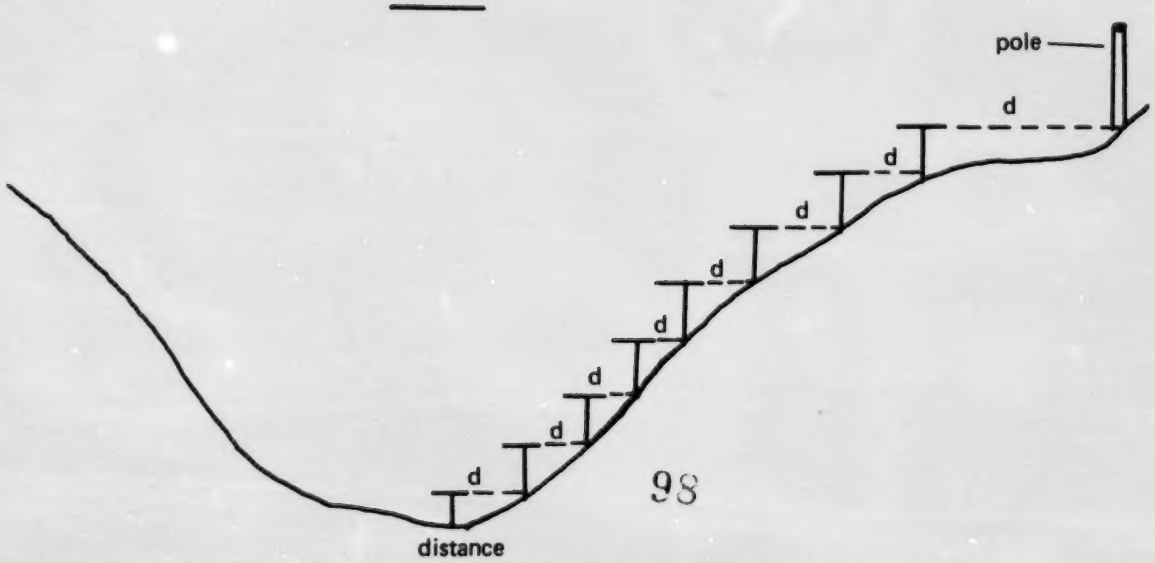
1. Let 1 square = 3 ft.
2. On the line below mark on the positions of each location and the distances between each.

SLOPE A SLOPE B




Transect pole
transect
level
line of sight
eye
measure to nearest foot


Direction of
ravine
A
B
Direction of Slope
Direction of Slope


pole
d
d
d
d
d
d
d
d
d
distance

SOME IDEAS FOR MAPPING AND SURVEYING

1. Make a map of an area using different methods.
2. Determine the differences in elevation to find the water level of a pond if a dam of a certain height were constructed.
3. Fill in information about dominant vegetation on a base map from an aerial photograph.
4. Mark off contour lines on a hillside and then make a contour map of the hill.
5. Find the location of bench marks with the aid of a topographic map.
6. With a compass, determine the azimuths to landmarks within a sight. Walk to them and try to return to the starting point using only the compass.
7. With a map and compass walk to landmarks that are not visible from the starting point.
8. With a compass, walk the perimeter of an equilateral triangle and try to end up at the starting point.
9. Measure land areas using different standard units such as a yard stick, tape measure, meter stick, forester's chain, or rod.
10. Measure land areas using different non-standard units such as a pace, arm-yard, cross-reach, or body length.
11. Compare the slope of the land to the amount of soil erosion in each place.

12. Make a shadow clock to tell the time of day and relate the shadows to compass direction.

13. Estimate north-south lines by

sun-stick method)

sun-and-watch method) - outlined in The Scout Field Book

north star by night)

14. Measure distance to an object and height of an object by triangulation.

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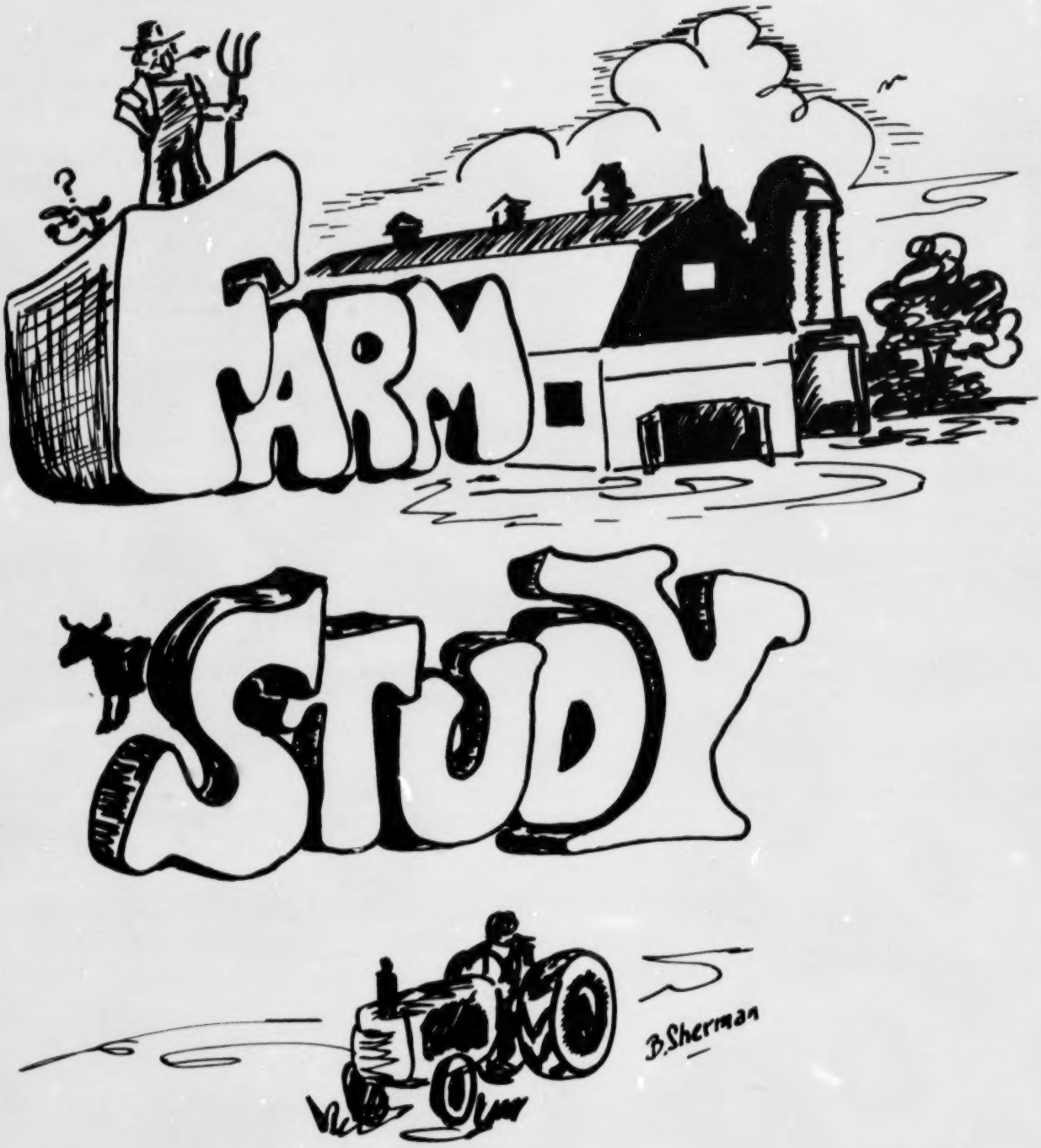

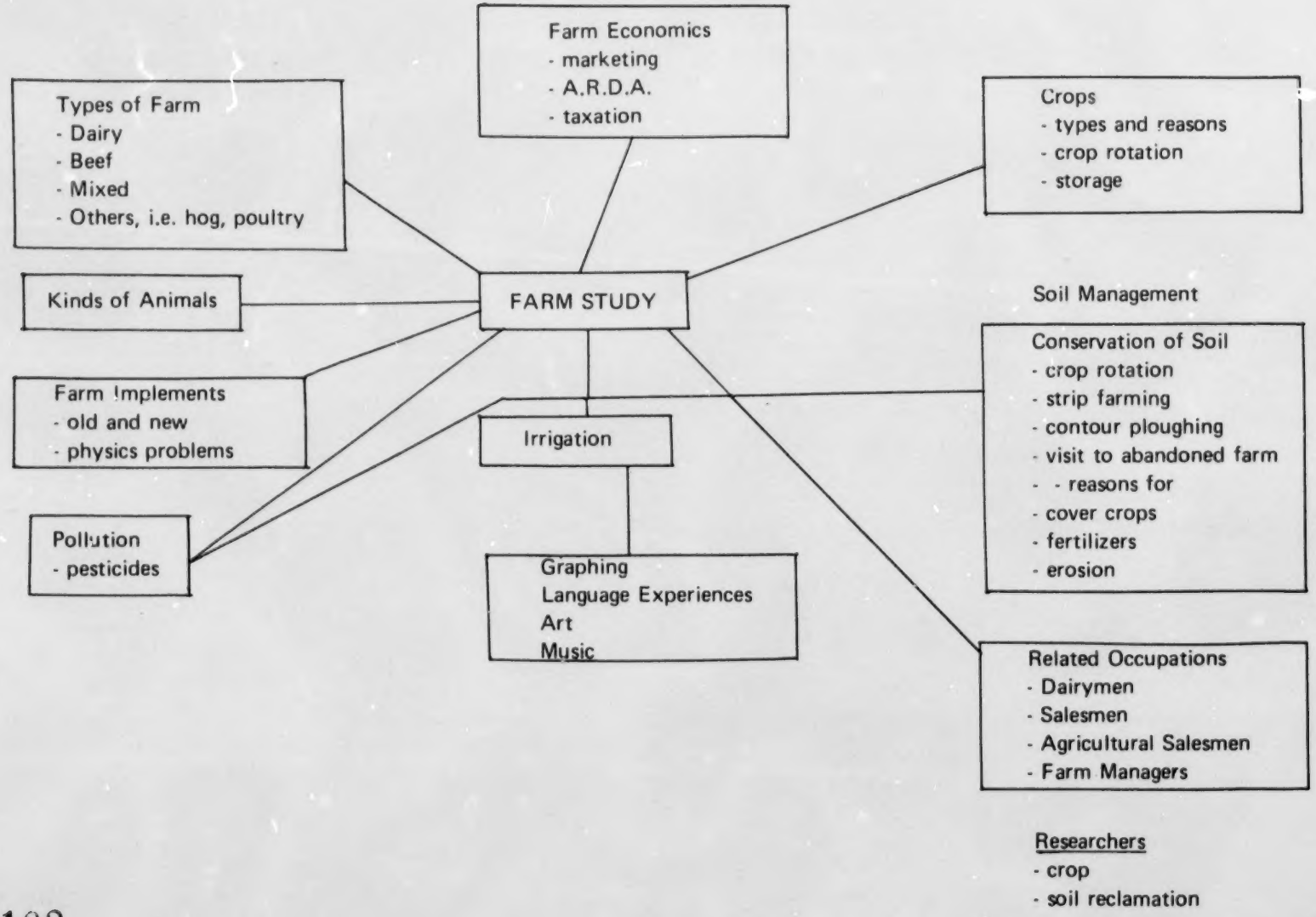
Farm Economics
- marketing
- A.R.D.A.
- taxation
Types of Farm
- Dairy
- Beef
- Mixed
- Others, i.e. hog, poultry
Crops
- types and reasons
- crop rotation
- storage
Kinds of Animals
FARM STUDY
Soil Management
Conservation of Soil
- crop rotation
- strip farming
- contour ploughing
- visit to abandoned farm
- - reasons for
- cover crops
- fertilizers
- erosion
Farm Implements
- old and new
- physics problems
Irrigation
Pollution
- pesticides
Graphing
Language Experiences
Art
Music
Related Occupations
- Dairymen
- Salesmen
- Agricultural Salesmen
- Farm Managers
Researchers
- crop
- soil reclamation

CONDUCTING A FARM STUDY

An intensive study of a farm enables students to visualize accurately the meaning of such terms as mixed farming and dairy farming, also shows them the complexities of a farm operation.

It is important that students be told to obtain as much information as possible by direct observation. The farmer should NOT have to answer a large barrage of questions, the answers to which can be easily obtained by careful observation and deduction. While the farmer may be happy to oblige, the students are more likely to obtain verbal information at the expense of exercising their skill at observing their surroundings.

Students should be given a series of questions and tasks to complete. The answers to these along with their maps, diagrams and sketches, will give the students a standard of comparison when they study agriculture in other regions. They will have a better understanding of the influence of geographical factors such as climate, soils, markets, and transport facilities on a farm operation, and of the many problems faced by farmers today.

The following are some questions which might be pursued on a farm study (source: UNESCO: Source Book for Geography Teaching. Longmares page 55).

1. Prepare a rough plan to show the layout of the buildings, roads, etc. Indicate what each building is used for. Indicate the direction of north and the approximate scale.
2. Prepare a sketch map of the farm, showing (a) the field arrangement, (b) the acreage of each field and of woodland and pasture (c) water courses (d) ponds and wells (e) windbreaks (f) roads and lanes (g) fences (h) stone piles, quarries and gravel pits. Indicate approximate scale and direction, by means of contour lines, attempt to show relief.
3. Obtain, with permission, two or three representative grab samples of soil for later analysis of acidity, structure, texture, colour, etc.
4. Livestock
   (a) What livestock is kept on the farm? Identify the breed of each, and number of each breed.
   (b) If the farmer breeds his own livestock, attempt to find out what his breeding program is, and the reasons for it. Is he breeding for weight gain, lean meat, milk yield, fat content, etc?
   (c) If he purchases his livestock, at what weight, age and location does he acquire them? How are they transported to the farm?
   (d) What disease control measures does he practice? What diseases must he be alert for?
   (e) How is manure collected? Is it used on his fields? Does waste disposal present problems?
   (f) At what weight does he sell his livestock? How long does it take for this weight to be attained? How much feed does it take to put on a pound of weight?
   (g) How are the animals being prepared for market? Where are they marketed? How often? What marketing procedures are followed? Is the livestock marketed through a Marketing Board?

(h) What does he feed to his livestock?
(i) Does he grow and prepare all of his feed, or does he purchase some? If so, what, and how much?
(j) What are his water requirements for his livestock? What are the water supplies? well? spring? lake or river?

5. Crops
   (a) What types of crops are grown? How much of each (weight or volume) does he produce?
   (b) When and how are the crops planted? Harvested?
   (c) What fertilizing and spraying program does he follow?
   (d) How is the crop stored? Sold?
   (e) Is there a crop rotation plan? If so, what? If not, why not?
6. Prepare an inventory of the farmer's machinery.
7. Estimate his capital investment (based on the value of land, buildings, equipment, livestock, and improvements such as tile drainage and fences).
8. (a) How many people are employed on the farm?
   (b) What is the total cost of labour annually?
   (c) Is there specialization (specific division of labour)?
   (d) Do the farmer's helpers live on the farm? If so, is accommodation included as part of their remuneration?
9. Prepare a chart showing the seasonal operations for each month of the year.
10. Find out upon your return to school:
   (a) as much as possible about the climate (last spring frost, earliest fall frost, frost-free period, heat units, range of deviation of precipitation, mean temperature and precipitation for each of the summer months, winter temperatures, amount of snowfall, etc.) and discuss the effects of these aspects of climate on the farmer's activities and operating costs.
   (b) Prepare a map (or Maps) of the farm locality showing physiographic features, soil types and/or soil capability, and local settlements, marketing centres, transport routes, direction of prevailing wind, etc.
11. Discuss and assess whether this farm is typical or atypical of farms in the region, and whether or not it reflects common trends and problems in agriculture.
12. Hold a contest to produce the most accurate, complete and clear maps and diagrams of the farms studied.

A GUIDE FOR THE CLASSIFICATION AND RATING OF FARM SOILS

Prepared by Department of Soil Science
Ontario Agricultural College

Physical Features used to determine Land Class -
(Check one description under each heading)

TEXTURE (Topsoil)

- Sand
- Sandy Loam
- Loam, Silt Loam
- Clay Loam
- Clay

TOPOGRAPHY

- Level
- Gently Sloping
- Rolling
- Hilly
- Steep
- Very Steep

STONINESS (Topsoil)

- Stonefree
- Slightly Stony
- Medium Stony
- Very Stony
- Excessively Stony

DRAINAGE

- Good (or Tiled)
- Fair
- Poor
- Very Poor

FLOODING

- No Flooding
- Flooding

EROSION

- None
- Slight
- Moderate
- Severe
- Very Severe

DEPTH TO BEDROCK

- Deep, over 3'
- Mod. Deep, 2-3'
- Shallow, 1-2'
- Very Shallow, less than 1'

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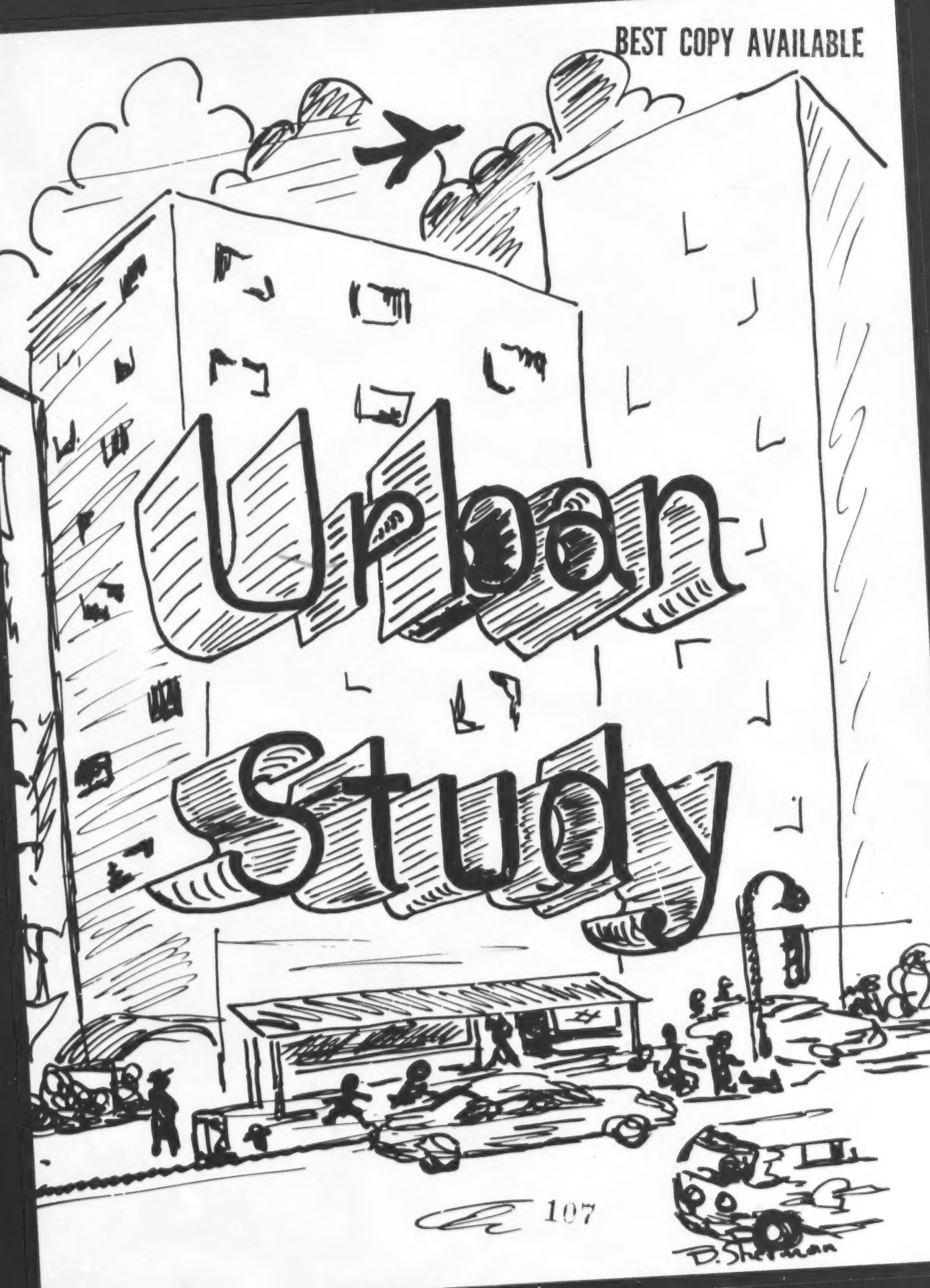

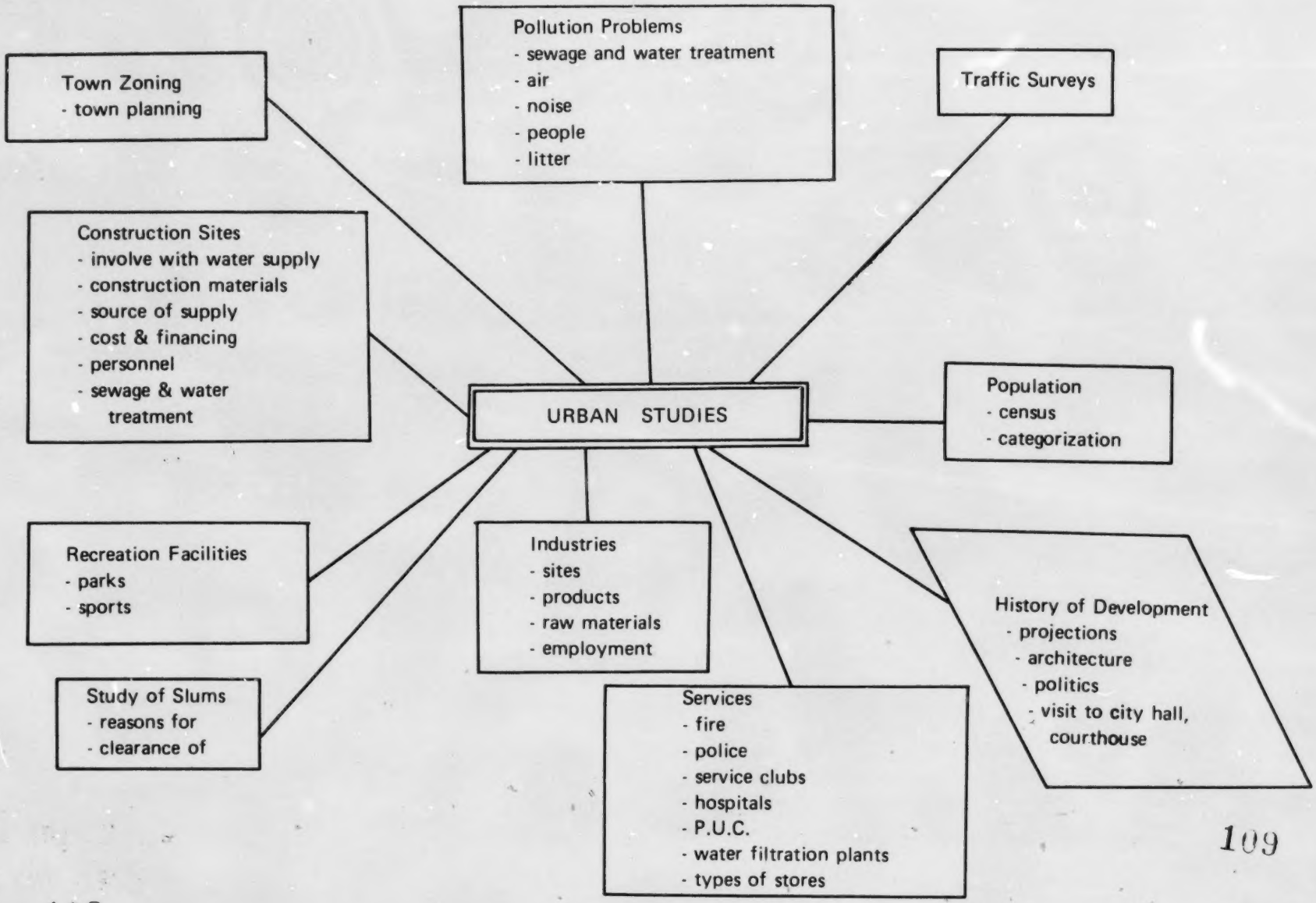
Pollution Problems
- sewage and water treatment
- air
- noise
- people
- litter
Town Zoning
- town planning
Traffic Surveys
Construction Sites
- involve with water supply
- construction materials
- source of supply
- cost & financing
- personnel
- sewage & water treatment
URBAN STUDIES
Population
- census
- categorization
Recreation Facilities
- parks
- sports
Industries
- sites
- products
- raw materials
- employment
History of Development
- projections
- architecture
- politics
- visit to city hall, courthouse
Study of Slums
- reasons for
- clearance of
Services
- fire
- police
- service clubs
- hospitals
- P.U.C.
- water filtration plants
- types of stores

CHEESE FACTORY

1. When was the factory built?_____ How long has there been a cheese factory on the site?_____
2. From what distance is the milk drawn?_____
3. How many farms sell milk to the plant?_____
4. How much milk is used daily?_____
5. Describe the stages in manufacturing cheese:_____
6. How long is the cheese stored before being marketed?_____
7. Must the temperature and humidity be controlled?_____
8. How much cheese is produced?_____
9. What is done with the whey?_____
10. Is there any evidence of stream pollution?_____

VISITING AN INDUSTRIAL PLANT

When arranging a tour of an industrial plant, teachers would be wise to find out in advance if there are special requirements for students to meet, such as wearing old clothes, safety glasses, etc. It is also wise to find out if any of your students have a physical condition which might be aggravated by conditions in the plant. Asthmatic students, for example, might experience discomfort and distress in a dusty factory or in a chemical works where there are strong fumes. Tour guides generally want groups to stay together, as they move on the tour. Stress the need for this to your students in advance. It is unfortunate that some students may need to be reminded that they are representatives of their school, and that there is no room for immature behaviour.

Students can do some preparatory work beforehand, such as studying a topographic map and/or aerial photographs showing the plant's site and situation. These aids may also give clues as to the existence of related industries, raw materials, reliance upon various systems, housing, energy and full requirements, etc. A series of questions may then be developed before the tour, so that the students know what to look for when they arrive.

There must be a follow-up to the tour in the classroom. Observations must be clarified and verified.

The acutal follow-up may include a map of the plant, a flow diagram showing the stages of processing from raw materials to final products, a survey of manufacturing in the region, an analysis of the industry's hinterland, a study of the water requirements of selected industries, etc.

You may have decided to use the tour as an introduction to the topic of industrial location, but do not hesitate to relate their observations to topics elsewhere in the syllabus that deal with transportation, population, mobility, industrial pollution, or regional planning.

Some questions which you might have your students investigate when visiting an industry such as C.I.L.:

1. When was the plant first established?
2. What did it manufacture at that time?
3. Why was the present site selected?
4. What are its water requirements in terms of quantity and quality (purity, chemical composition, temperature, etc.)
5. What proportion of the water is used (a) in cooling; (b) as a raw material incorporated in the product; (c) as a solvent; (d) as a waste remover?
6. To what extent is water repurified and recirculated?
7. What other raw materials and semi-manufactured products are required?
8. Where are they obtained?
9. In what quantities are each obtained?
10. How are they transported to the plant?
11. What are the energy requirements of the plant? Source of fuels?
12. (a) What docking and other transport facilities serve the plant?
    (b) How have they affected land use in the area? e.g. Has cottage development been discouraged? Do other industries share transport facilities?
13. What are the processes and stages in the manufacturing operations? Prepare a simple, labelled flow chart.
14. What products does the plant manufacture?
15. Are the products finished, or will they be further processed prior to marketing to the final consumer?
16. What is the volume and shipping value, if available, of each of the products?
17. Where, and to whom, are the finished manufactures sold? How are they shipped?
18. To what extent is this plant integrated, vertically? Horizontally?
19. How many men, and women, does the plant employ? Does one sex dominate the labour force? If so, why?
20. Do most employees drive to work?
21. Does the plant operate on 24 hour/7 day week basis?
22. What is the annual payroll of the plant?
23. What is the average income per worker (value of payroll - size of labour force.)
24. Is this a branch plant?
25. Where is the parent company's headquarters?

26. What problems face the industry? Is the industry expanding or contracting?
27. To what extent does a topographic map and/or aerial photograph explain or fail to explain the selection of the plant's site and situation?

CONDUCTING A VILLAGE SURVEY

A village survey can reveal a great deal about the economic and cultural geography of a region, and may yield more suprising information not evident to the causal visitor. For example, a picturesque village on Conception Bay in Newfoundland turned out to be, on investigation, a fishing village turned dormitory town. The bread-winners either commuted daily to St. John's nearly 60 miles away, or were away working on the Churchill Falls project in Labrador.

It is best to provide your students with an outine or base map of the village. Then assign them tasks such as the following:

1. Using the colours indicated, attempt to classify the buildings as follows:
   a) residential (A for apartments) green
   b) commercial (shops, cafes, hotels) red
   c) industrial (garages, vehicle repairs) feed mills, founderies, small workshops blue
   d) institutional (churches, church bells, meeting halls, medical centers, schools) yellow
   e) farm brown
2. Further classify the buildings mapped by their functions as indicated below:
   a) church - Protestant - CP
      - Roman Catholic - CR
   b) post office - P
   c) garage - G
   d) restaurant or cafe - R
   e) bank - Ba
   f) hotel - H
   g) school - Sc
   h) shop - Sh
   i) barn - Bn
   j) feed mill - Fm
3. a) List the commercial and industrial buildings individually - e.g. 1 hairdresser, 1 barber shop, 2 confectionary stores, 2 general stores, 1 service station, 1 farm implement dealer, etc.
   b) What industries and businesses have there been in the past that have since shut down?
4. The following questions might be asked about the site and situations of the village and its communications:
   a) Is, or was the village on a main road, at a crossroads, or at a junction of a roadway and railway?
   b) Is the railway still in use? If not, what use is made of the right-of-way? Of the settlements? Former stations?
   c) What are linked to the village by road and/or railway?
   d) Is there a bus service or rail service? How frequent is this service?
   e) Is the village on a hill or in a valley?

f) Is it on a river? Does this river provide (i) transportation (ii) water power - or has it in the past?
g) Is the village on a peripheral boundary? How has land-form affected the villages site and situation?
h) Draw a sketch map to show the position of the village in relation to the surrounding area.

5. a) What materials are the buildings in the village constructed of?
b) Are there materials available locally? If so, where?
c) Are properties fenced? If so, what with?
d) Make a simple labelled sketch of a typical house, showing such features as porch, window arrangement, roof construction, lintels, gingerbread trim, verandah screening, etc.

6. Attempt to find out the population of the village - perhaps from the post office, or from several inhabitants such as grocer, a minister, a teacher, etc. Also attempt to find out their occupations and place of work.

7. a) Are there new buildings, or are all of them old?
b) Are properties well kept and maintained?
c) Is there evidence of abandoned property?
d) Is the village growing or decreasing in size?
e) Has it changed function(s) ?

8. If there is a high vantage point that will provide a good view of the village in relation to its surroundings, a sketch will help the student to focus on salient features.

The observations will have to be discussed and verified back in the classroom. Subsequently the class can consider such concepts as functions of villages and small urban centres, the reasons behind the decline of the rural hamlet and village, or the Central Place system. The village study can also lead to urban studies, or to a study of changes in agricultural land use, etc.

URBAN STUDIES

Marketing Research Projects

One of the main purposes of outdoor education is to relate outside activities to the classroom. This can be done in several ways. One way is to bring outside people into the school, but this has an air of artificiality. If the students themselves go into the community, gather the information and bring it back to class, the impact and retention should be much greater. This approach also relates distant textbook topics to local urgent situations, and allows the student to see things from a management standpoint rather than a customer viewpoint.

Allow a minimum of 2 periods for completion. Select a topic from your lessons and look for a local authority or application. (See sample list of topics supplied) If necessary set up an appointment for the students. Send a group of 2 or 3 students to conduct an interview, evaluate a window display, make a traffic survey, etc. Have the students then compile a report (maybe over a Coke at the local restaurant). The

The following day have the students form a panel to present their findings to the class. The question period which follows may necessitate a return for more information.

This technique need not be limited to marketing but the following questions are in this context. Be very specific with the questions and do not try to get the students to find out "everything".

Sample Questions

- What is policy regarding returned goods and selling goods on approval?
- What is policy regarding deliveries? time, frequency, minimum order, etc.?
- What systems of inventory, other than physical, are used in your store?
- Ask a window-dresser how the design of mannequins has changed over the years. Does the design tell the period of manufacture? What precautions are used in the handling of mannequins?
- What procedures are used when an account is overdue?
- Is shop lifting a problem? How is it handled?

Be sure to follow-up and thank the store owner for his co-operation.

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CANOE TRIPS AND OUT–TRIPS

PLAN–DETAILS

A. - Route to be taken
- How many children - tentative itinerary is advisable also.
- How many teachers, adults, experienced canoeists needed (one in stern of each canoe).
- Get license for fire and fishing if required.

B. PACKING FOOD
1. Put sugar, salt, potatoes etc. into plastic food bags.
2. Separate canned goods into 2 or 3 packs - weight factor.
3. All food is not in the same pack.
4. Put jam etc. into tins with tight lids.

C. PACKING PACK SACKS
1. Put something soft at back so that nothing will dig into the back.
2. Guide or strongest person carries heaviest food pack.
3. Make sure that everything is tight.
4. Check off food list again as it is packed into bags.
5. Pack eggs in oatmeal tin.
6. If repacking after meal, make sure that jam etc. is washed from outside of tins.

D. GENERAL REQUIREMENTS
1. First aid kit (in supervisor's canoe).
2. Chlorine or water purifier.
3. Hatchet or axe in case.
4. Matches in waterproof container.
5. Toilet paper.
6. Soap for dishes - and for pots (soap outside of pots with bar soap before putting on fire) - liquid soap best.
7. Tea towels. > or paper towels
8. Dish cloth. >
9. Scouring pads.
10. Tent (pitch in spite of weather).
11. Insect repellent.
12. Mosquito netting.
13. Dishes and cutlery.
14. Can opener.
15. Stirring spoons (long wooden handles).

E. COOKING REQUIREMENTS
1. 3 pots (which fit into each other or nesting kit).
2. Frying pan.
3. Grate or grill.
4. Salt, pepper and other seasonings.
5. Sugar - brown and white.
6. Bread and butter etc.
7. Lard.
8. Check menu for other requirements.

F. PACKING CANOE (three persons)

1. Place one pack in front of sterner leaving room for passenger.
2. 3 or 4 packs evenly balanced across in front of passenger.
3. Some packed in bow -- e.g. axe - pack for safety, first aid kit, lunch pack etc.
4. Canoe slightly stern heavy.
5. Lash in packs to thwarts and gunwales.
6. All canoeists must wear life jackets.

G. CAMPERS' EQUIPMENT

1. Bed roll or sleeping bag.
2. Warm pyjamas.
3. Heavy sweater.
4. Slacks or blue jeans.
5. Shirts (1 or 2)
6. Shorts (1 or 2)
7. 2 pr. socks.
8. 2 pr. shoes (1 heavy, like saddle shoes).
9. Raincoat and hat.
10. Flashlight.
11. Tooth brush and paste.
12. Face cloth and towel.
13. Soap.
14. Comb.
15. Bathing suit.
16. Hat for canoe.
17. Insect repellent.
18. Knapsack.
19. Pocket knife.

Camper starts out wearing some of above equipment.

Save 1 clean blouse or shirt to change into at lunch on last day -- arrive at camp clean and rested.

H. CHOOSING A CAMPSITE

1. If area to be visited has not previously been explored, look for high sheltered spot. There should be a fairly good beach to land the canoes and plenty of firewood available.
2. Make sure that there are no swamps in the immediate area -- flies and mosquitoes.
3. Sand is a poor type of bed base. If necessary to sleep on it, use spruce boughs with heavy parts underneath and flat part needles up.

I. SETTING UP CAMP

1. Have each canoe assigned to duties -- e.g. one cooks and serves
   one gathers firewood
   one prepares campsite and fire
2. Keep area cleared for kitchen.
3. Hang up pots, pans and foodpack.
4. Clear area for sleeping and lay beds before dark -- check for stones, stumps.
5. Set up tent and put up mosquito nets.
6. Prepare latrine -- 2 logs piled on one another supported by rocks.
   When leaving camp throw earth over latrine.
7. Outline any rules needed (wandering away etc.).

ON A SLEEPOUT OR COOKOUT

On Arriving:

If you are picking a sleepout or cookout area discuss the selection with your group. Ask them to pick an areas so little or no damage would occur as a result of your camping in the location. The goal is to preserve the area for others, and to leave it in better condition if possible.

If you are using an established campsite or cookout area ask the campers if they think it was left in the proper condition by the last group that used it.

Points to Discuss:

How would each of the following affect the environment:

1. Location of fire.
2. Digging hip holes.
3. Pitching the tent.
4. Cutting saplings.
5. Location and use of a latrine.
6. Use and storage of down wood.

In Using Materials:

1. Can I use these materials so they can be reused?
   a) No. 10 tin cans, food wrappers, foil.
   b) left over food.
   c) charcoal from the fire.
2. What do I do with garbage?
3. What do I do with dish water?

Before Leaving the Site:

1. What waste materials should be taken back to camp?
2. Have we filled in all holes? Covered the latrine?
3. What do we do with the ashes? Aluminum foil?
4. Fire wood left over -- how do I leave this?

SUGGESTED FIRST AID PROCEDURES

SEVERE BLEEDING: Whether spurting from an artery or flowing briskly from a vein requires immediate attention. Control by applying direct pressure with a clean dressing directly on the wound or by tightly grasping the entire area or by pressure on the proper area.

SMALLWOUNDS: Always require cleansing with soap and water around the wound. A sterile dressing should then be placed over the wound to prevent entry of more germs.

SPRAINS: Commonly occur in ankle or wrist. Immediate application of cold compresses followed by wrapping with a firm bandage will help prevent swelling and will ease pain. Later application of warmth and hot compresses will reduce swelling and ease pain.

FRACTURES: Most broken bones are simple or "closed" fractures. Prevent any further damage being done by gently supporting the broken bone against the body in a near normal position using plenty of padding and bandages. In case of a leg, secure the injured limb to the sound one. Make sure there can be no further movement of the broken ends of the bone.

BURNS: Pain and danger of infection is greatly reduced by excluding the air. Place plenty of clean dressings and burn dressing over the burned area and fasten them in place.

SHOCK: Keep the patient warm, quiet, and comfortable. Do not move the patient unnecessarily.

ASPHYXIA: Remove the cause of the condition or the patient from the cause and commence artifical respiration immediately. Make sure mouth and throat are free of obstructions and instruct bystanders to provide warmth to the patient.

BEE STINGS: These are common and may be dangerous. Cold compresses, application of ammonia or baking soda, or magnesium sulphate (Epsom Salt) soaks will usually give relief. The stinger should be identified and removed, with a clean needle, if present.

POISON IVY,
POISON OAK: Wash the exposed parts with non-medicated soap and hot water as soon as possible after exposure. Sponging with equal parts of ether and acetone may be helpful. Apply soothing lotions or paste of sodium bicarbonate.

THE NIGHT WORLD AND TWILIGHT HOUR

Quite often campers miss many of the activities of the wood and field because they are too preoccupied with cooking, setting up camp, or because they are occupied with in-camp activities at the hour of twilight, dusk, or darkness.

Design a trip with your group that will take you out just before dusk or twilight. Get situated in a comfortable spot overlooking a pond, lake, water hole, or field. Many animals will become active at dusk. Quite often while walking quietly or sitting we have seen fox, beaver, racoons coming out for their evening activity.

Darkness may close the door of one world but it opens the door of another. The night world becomes a world of sight, sound and smell. However the sight is very limited depending upon the weather and moon. Why are so many creatures active at night? What advantages does nocturnality offer? There are many reasons why animals may adopt to the nocturnal way of life. In desert habitat, most all animals are active after sunset. The absence of the sunlight causes a drop in the air temperature (a drop as high as 50 degrees F in many area) and a subsequent drop in the evaporation rate, a very important factor in the lives of desert animals.

Many animals are able to avoid the day-active-predators and their chances for survival are greatly enhanced during darkness. Nocturnality is something of a sanctuary from predators.

Activity at night may reduce the competition which is so prevalent in nature. Two different species of animals living side by side might be serious competitors if active at the same time. By feeding at different times they avoid competition, and may even be unaware of one another's presence.

The nocturnal habit may have many other advantages of which man is unaware. In many cases, the nocturnal habit probably has a definite survival value.

SURVIVAL HINTS WHEN IN THE WOODS

Note:

The following hints have been taken from information kits provided to members of the R.C.A.F.

Introduction

Don't be a "wise guy". Make careful preparations for all trips into the woods. Make sure by doing so that you will return.

When Lost in the Woods

You must be prepared to help yourself. A little knowledge, a minimum of skill, and a strong deisre to live are very important.

1. When "lost" -- stay put and remain calm.
2. Study surrounding -- you will need water, sheltered spot for camp; you will need wood. You will need an open area for signal fires.
3. If your wood supply permits, always keep a fire going.
4. Remember, three fires is the International Distress Code. Build them in a triangle 60 to 90 feet apart.

Building Fires

The best firewood is standing dead trees. If it has been raining, under-layers of birch bark make good tinder.

"Feather" wood- (make a fuss stick) - for tinder. As soon as your fire is completed and lit, pat several layers of green leaves or needled branches over top of it. This provides both a roof and a smudge for your fire.

A lone spruce or dead tree in a clearing could also be used as a signal fire.

Building the Camp Fire and Shelter

Not to be large. No closer together than 6 to 10 feet. Clear ground around fire to prevent spreading. Build fire in radical manner, as centre burns push ends into fire.

Keep it going at all times - this tends to keep animal intruders away.

Fire by night and smoke by day best signals. Build fire against a rock, if possible, for reflection, or build your own reflector out of green, light-coloured wood. Either birch or stripped wood is all right.

Making a Mattress

Spread evergreen (e.g. spruce) boughs curve side up. Make mattress 8 to 10 inches thick for a good insulation to ground.

Making Shelter

Build a shelter of evergreen branches with heavy end of branch at top. Needles will then shed rain.

Taking Stock

Once signal fires are ready, with campfire and shelter completed, then you are all set to take stock.

Examine

a) Your person. Empty your pockets and figure how each article can be used to serve you in your present situation For example, keys, coins, etc. can be used for fishing weights, bright coloured wood as flies, silver paper as lures. A pin, piece of wire, or a can opener key can be used as a fish hook-sharpen on a rock. Paper, paper money, leaves or birch bark with slits in them as serve as goggles. Thread from clothing, unravelled wool can be used as fish line, or to weave a fish net. Mess kit pans or dishes, can be used as reflectors for signalling planes.

Examine

b) Around you. Look for and try fishing with bent pin or hooks. Bait used can be grasshoppers, worms, bugs, small brown roots or berries. Look for edible berries such as partridge berries, signs of grouse, birds, rabbits, porcupines etc. to supplement food. Central portion of young shoots of cattails are edible.

Food Rationing and Supplementing

Use as follows:

1. Eat no food the first day of survival.
2. If water is scarce, drink no water the first day.
3. To get most benefit from food eat small amounts at a time, and eat slowly.
4. Whatever rations you have with you, divide into equal parts and supplement with fish, game, edible berries, etc.

Try setting spring up snares to catch rabbits etc. Go easy though on this type of food. Supplement it or you will be ill. Roasted grasshoppers have a nutty flavour and are nourishing. Fry or cook meat or fish for 20 minutes to the pound. Boiling is the best method. Boil water for drinking. In cold weather eat plenty of fats. If in doubt on plants and animals as to edibility, eat a small amount and wait 24 hours.

Storage

No problem in winter. In summer cut fish and meats into narrow strips and dry them in the sun.

Water - Snow water in winter is good for tea or soup.

Personal Welfare

Sunburn and weatherburn - for protection wear a hat and keep in shade.

Injuries

Even minor injuries are potentially dangerous in the bush. Treat all bruises or sprains carefully.

Bleeding - apply direct pressure over area of bleeding. If bleeding is from an extremity elevate it.

Care of Feet

To make blistering less likely, keep feet dry, also socks. At every opportunity dry socks at fire. Regular massage of feet will prevent frostbite. Cover a blister.

Insects

Three methods of protection in bush:

a) Make a smudge fire; green wood or leaves to be used.
b) Wrap a handkerchief or cloth around neck and back of head, Arab style, well into shirt and hat. Tie clothing at wrists and tuck pants inside boots or socks.
c) Insect repellent.

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Reflector Fire

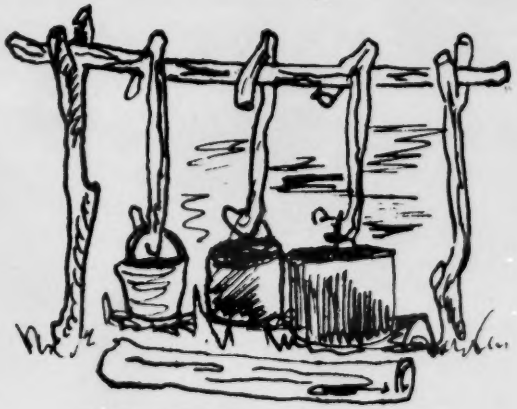
Crane Fire

Muslin Food Larder

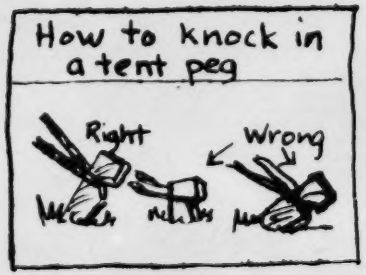
Camp Oven

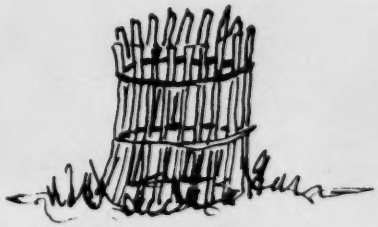
Trench Fire

Mug and Plate Rack



Camp Cooking Range





Waste Paper Basket

Miscellaneous – SOCIAL STUDIES

1. Find evidences of how man has affected the environment.
2. Find evidences of how the natural environment has affected man.
3. Determine why the early settler would choose a particular location for his home site.
4. Make a rough sketch map of a home site and other man-made features such as outbuildings, well, pond, road, or cellar.
5. Make a physical and cultural survey of an area.
6. Compare aerial photographs to the land. Obtain aerial photographs taken 20 to 30 years ago to observe the changes that have taken place.
7. At an old home site foundation, make a sketch of the building and vegetation as you think it might have looked when it was occupied by man.
8. With a compass in hand, set a bee-line course and hike cross-country. As you go record the human and physical geography on a topographic base map.
9. Obtain some old tools and figure out how man used them.
10. Make a fire with flint and steel and bow and drill.
11. By observing old buildings, figure out how they were constructed.
12. Examine old farm sites to determine what type of people lived there at various times.
13. Explore for artifacts which provide clues of how the people lived.
14. Explore a cemetery to discover the local history recorded on the grave stones and surroundings.

LANGUAGE ARTS

1. Write about the seasonal changes that might occur in your immediate location.
2. Try to imagine what your immediate location would be like in ten, fifty or one hundred years.
3. Express your reactions to the natural environment through the medium of Haiku poetry.
4. Use figures of speech to describe the out-of-doors such as alliteration, metaphor, simile, hyperbole, or onomatopoeia.
5. Personify a tree in a cemetery, along an old road, or at a homesite.
6. Using the senses of hearing, touching, smelling, tasting and observing, describe your impressions of objects of nature.
7. Choose something which appears at first to be ugly or not particularly beautiful. Describe the object again after looking carefully at it.
8. Observe and describe familiar shapes, forms, designs or figures in objects such as gnarled wood, areas of light between tree branches, clouds, or rocks.
9. Write a story about a miniature world as magnified through a hand lens.
10. Write about the thoughts that occur as you are seated in the woods.
11. Compare the writings of poets such as Keats, Wordsworth, Sandburg, or Frost and the writings of authors such as Emerson, Thoreau, Burroughs, Muir or Audubon to how you react to the same things that they write about in nature.

12. Dramatize stories about life in the woods.
13. While in the out-of-doors, construct an outline for a factual report of an experience.
14. Take field notes of important information discovered outdoors.
15. Write a fictitious diary of a person who might have: lived in an old house, travelled an old road, or played in the woods.
16. Examine the meaning of various words related to the out-of-doors.
17. Examine the sources of folk superstitions and sayings about the out-of-doors.
18. Compare how differently each person perceives his environment by having each one wirte about it and share what he has written.
19. Listen for a short time and list all the different kinds of sound heard. Develop a system to increase your retention of new sounds heard.
20. Have the pupils compose the ending for an unfinished story about the out-of-doors.

Mathematics (INTERMEDIATE AND SENIOR)

The Fibonacci Sequence

Many creations, both of nature and of man, seem to be related to a sequence of numbers named after athe Italian mathematician, Leonardo Fibonacci (c1170 - 1230). The sequence was first used by Fibonacci to solve a hypothetical problem concerning the reproduction of rabbits.

The Fibonacci sequence is 1,1,2,3,5,8 ..... and the recursive rule may be developed. Patterns such as: 1,3,5,7 --------
1,3,9,27 --------
1,4,9,16 --------
may be investigated. Initially the emphasis should be on the relationship between a given term and the preceeding term.

The total number of pairs of rabbits at the end of the year is:

$$1 + F_1 + F_2 + \text{----------} + F_{12}$$
$$= 1 + 1 + 1 + 2 + \text{----------} + 144$$
$$= 377$$

It is interesting to note that the total number of pairs of rabbits at the end of the twelfth month is F_{14}. This is a general result and is often used as the basis for a puzzle. For example, if the sequence 1,1,2,3,5, -------- is given and we are required to find $F_1 + F_2 + F_3 + \text{----------} + F_{29}$ we know that the sum will be $F_{31} - 1$.

The leaves of some plants are arranged in a systematic pattern about the stem. The fraction $\frac{\text{number of turns}}{\text{number of leaves}}$ is made up of numbers which are consecutive, even or odd terms of the Fibonacci sequence. For example the fraction 1/2 is associated with the elm tree.

Fibonacci numbers occur in nature:

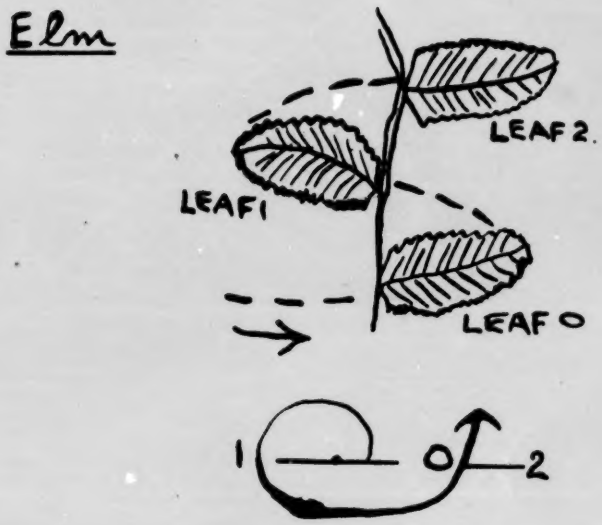
1) the scales on a pine cone
2) the branching of trees
3) the reflection of light rays

To relate the Fibonacci pattern to natural growth, a growth curve may be introduced. Rates of growth are approximated by pairs of successive Fibonacci numbers and a limiting rate of growth, Φ, seems to exist.

Field trips could be arranged to collect specimens illustrating the occurence of the Fibonacci pattern in nature e.g.

Pine Cones: the scales are arranged in spiral rows winding around the cone, one group winds in one direction, a second in the other.

Flowers: the numbers of petals in different flowers; the number of florets in flowers of the composite family; the number of spirals in the seed patterns of sunflowers, and the number of spirals in the segment patterns of pineapples; the arrangement of leaves (or twigs) on a stem.



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IMITATING REAL LIFE

This program introduces simulation as a method for studying certain real-life situations so that useful predictions can be made. Monte Carlo simulation is used to help plan for optimal traffic flow in a city.

Simulation is one of several techniques being used increasingly in the fields of applied mathematics and engineering to help solve practical problems. Since the approach involves direct imitation of events, it is not necessary to set up and solve equations. Instead, we conduct experiments with the simulation "model" to learn more about how the actual system, existing or planned, will behave under different sets of conditions.

Simulation is especially suited for investigating problems that involve traffic, for example, movement of goods in and out of warehouses, movement of material through production lines, movement of aircraft, ships, and other vehicles, and of course, movement of people. Typical objectives of such studies are to improve the traffic flow and service levels, and to reduce operating costs.

Most of these problems involve events which are distinctly random or statistical in nature. For example, arrival and departure times are not fixed but follow some probability distribution. Contingencies such as equipment failure and adverse weather conditions also have a certain probability of occurrence.

Random events such as these can be simulated by means of a sampling procedure which can make selections at random from a number of equally probable alternatives. Spinning a roulette wheel, rolling a die, or tossing a coin are concrete examples of this kind of random selection. Techniques for simulating real-life situations by using games of chance are often called Monte Carlo simulations, after the well-known gambling casino.

One advantage of the simulation approach is that it is relatively easy to increase the "realism" of the model by adding more events and more detailed probability information. One disadvantage is that a large number of samples must be used before meaningful conclusions can be drawn. Fortunately, high-speed computers can be programmed to carry out the random selections.

A "mathematical model" of a simplified traffic intersection may be developed. The model may be used to show how Monte Carlo simulation can help determine the best setting for the intersection signal lights.

The same kind of simulation model can be used to study other aspects of actual traffic conditions. Using the results of these studies it has become possible to improve traffic flow.

SOME SUGGESTIONS

1. Investigate situations that involve movement of people, for example, line-ups that occur on stairs, in cafeterias, and at supermarket check-outs. How has the designer attempted to minimize line-ups and provide good service?

Variables:

1. Clock: measures simulated time (in seconds)
2. Queue: measures current number of cars waiting at intersection
3. MaxQ: measures maximum length of queue observed so far

What changes to the existing facilities might improve the situation further? What additional costs, if any, would be necessary to improve the situation? Would an increase in service warrant the additional cost?

2. Carry out activities such as spinning a roulette wheel, rolling a pair of dice, and tossing a coin.

Can the outcome of any event in a sequence of events be completely predicted? Is there a formula to calculate what will happen in a given trial? How would you describe these events?
Is the phrase, "random events", a suitable description? What exactly do we mean by this phrase? What other methods can be used to produce random events? Do all these methods provide an acceptable degree of randomness, or do some have a bias? What are random numbers? How could random numbers be obtained from random events?

3. Investigate familiar situations which exhibit random behaviour. For example, how long does it take to get downtown by public transportation? Is the travel time the same every day? How does the travel time vary on different days of the year? Is the travel time the same at different times of the day? If not, how does it vary? What factors contribute to these statistical fluctuations? Which factors can be compensated for by careful planning? Which are completely unpredictable?

Further Suggestions

1. Conduct a survey of traffic light timings and settings in the vicinity of the school. What is the purpose of the "flashing green" phase and the "red in all directions" phase? How would you decide on the length of each of these phases? What other special techniques are used to improve the traffic flow? Are the timings and settings the same for all lights? Why should there be any difference?

2. Conduct a survey of traffic volumes and patterns in the vicinity of the school during both quiet and busy periods. For specific intersections make estimates of the average number of vehicles per hour in each lane and the percentage of vehicles making lane changes, right turns, and left turns. How are the timings and settings of the traffic lights related to the traffic volume and patterns?

3. Collect data on the arrival and departure of cars in a single lane of traffic at a stop light where no turns are permitted. Note both the time it takes to pass through the intersection from the waiting line, and the light timing. Use the logic flow chart to help simulate the arrival of the cars. Note that it will be necessary to construct the spinner and clock to fit the collected data. Try to make the simulations for as long as period of time as possible. Each student or group of students could work on different trials. Determine the maximum queue length for the particular light timing. Check this if possible by observation.

4. Discuss how the simplified intersection model would be modified to add another lane of traffic. Draw a flow chart which allows some vehicles in the right lane to turn right. What complications would be introduced by allowing cars to turn left?

5. Some students could research the history of simulation techniques, especially Monte Carlo simulation. Other students might investigate the different types of problems that have been solved using simulation.

6. A field trip to the Metropolitan Toronto Traffic Control Centre could be arranged for students in the Metropolitan area. Questions related to the use of simulation studies could be asked.

The following suggestions are for computer science students only.

7. Develop in more detail the flow chart logic for determining whether the light is red or green. What other changes would be necessary before programming this simulation for a computer?

8. Investigate methods for generating random numbers on a computer. Why are these usually referred to as "pseudo-random" number generators?

9. Instead of advancing the clock in fixed intervals of time, it is often more efficient to advance the clock to the next event. Why? What changes in program logic would be necessary to carry out a "next-event" type of simulation?
Hint: the program will have to keep track of the time at which each type of event is going to occur.

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ART

1. Find examples of characteristics of abstract art in nature.
2. Record how many colors you can observe in a small area delimited by a circle of two inch diameter.
3. Draw a picture about a story read in the outdoors.
4. Form the body into shapes of trees or other natural objects observed.
5. Make arrangements of dried grasses and other plants for decorative purposes.
6. Take photographs in the out-of-doors.
7. Squint the eyes to see differences in light and dark. Make a sketch of what

you observe.

8. Find examples of lines and shapes in nature.
9. Find examples of design in movement.
10. Experiment with branches, feathers, bones, grasses, seeds, or other natural materials as paint brushes to create various effects such as massiveness or delicateness.
11. Use wood charcoal from a fire to make a sketch.
12. Find natural clay in a stream for modelling with the hands or a tool such as a stick or rock.
13. Use plant pigments from flowers, stems, fruits, leaves and/or rotted wood to make a sketch on fine sandpaper or paper.
14. Make a collage of pebbles, seeds, or other plant parts using surfaces such as a slab of wood or cardboard.
15. Represent textures in nature such as tree bark, rock, or seed pod surfaces with modelling clay.
16. Find different surfaces to draw or paint upon such as pieces of wood, bark, or rock, packed soil, woven grass mats, or leaves.
17. Make natural paints and dyes with plants, muddy water, or other natural colours.
18. Use objects such as wood, bark, seeds, leaves, or other natural objects to make prints on paper or cloth.
19. Cut designs in vegetables such as a potato or turnip for block printing.
20. Weave grasses and other vegetation into mats.
21. Make animal figures out of objects such as twigs, stones, and seeds.
22. Carve from soft wood or tree bark.
23. Find different shades of the same colours.
24. Make sand castings with mud, clay, or plaster of Paris.
25. Make clay masks of Indian faces while at the Indian shelter.
26. Make twine or rope from the inner bark of certain trees.
27. Construct mobiles using natural materials.

ART LESSON

Outdoor sketching with attention to composition and colour harmony.

Materials: Drawing boards, manilla paper, charcoal, paint, brushes, water.

Procedure: The site can be a motivation centre and create a situation for applying skills already learned.

The children should already have had discussions on composition

1) focal point
2) balance
3) leaving out, adding, re-arranging

Now the children will use home-made viewfinders to arrange the composition they want to develop. Here they can make many small sketches (2" x 3") until they find or discover one satisfactory to them. This is the one they will work with. As they do this they will observe the variations of colour (the greens, the blues) the cloud formations, the tree shapes, the spaces and patterns in the branches.

In this relaxed atmosphere where the child is actually a part of it, the experience is bound to be much richer than with a similar view from a classroom window. Here,

in the live environment, in order to 'say' on paper one must observe first - this great demand for observation leads to an awareness of nature and is likely to develop a greater appreciation of it. (While all this is going on - the child might be producing a rather pleasing landscape painting!)

All the things here can be seen on either film strip, T.V. or in books, but there is that extra sensory experience that comes from the live environment - the sounds of wind in the trees, the feel of damp clay, the coolness of moss, the pop of seed pods, leaves floating on the water currents, and many more. These must be experienced to be felt - and this is the situation in which they can be experienced.

MUSIC

1. Make different sounds and rhythms from the objects of nature such as stones, seeds, sticks, or dry grass.
2. Dance to natural rhythms and sounds such as the wind in the trees or grasses, the flowing water, or the calls of insects or other animals.
3. Make a willow whistle.
4. Imitate animal sounds.
5. Using a tape recorder, record animal sounds.
6. While listening to tape recordings of music related to the outdoors, determine how the composer represents nature's sounds and rhythms.
7. Compose songs based on outdoor experiences.

Compose a song to the tune of "The House That Jack Built"

Food Chains - example - this is the horned owl
that ate the skunk
that caught the frog
that ate the insect
whose larva chewed the leaf of the milkweed plant
that is growing from the earth beside you

MUSIC IN NATURE LEVEL - Junior

Lesson Objectives:

1) To help chidlren progress in aural awareness of rhythm and pitch in nature.
2) To nurture and guide musical imagination and creativity.
3) To arouse interest in musical compositions relating to nature.

Background Knowledge:

1) The Running Brook, by Schubert - New High Road, Book 5, page 54
2) Elements of Music - (a) rhythm (b) pitch

Materials:

Small tape recorder: rhythm and melody instruments such as triangles, tone bells, sand blocks, claves, flutophones, recorders, small drums, bird whistles.

Mode of Instruction: (a) discovery & creativity (b) group & small group

All sing familiar song - The Running Brook - while walking along the river bank. Accompany song by softly clapping two beats to a measure.

Coming to a part where the river is wide and tree bordered, all sit on the bank and listen for a few moments to any one particular sound. (sensitivity approach)

Individuals describe sounds heard and classify type as rhythm or pitch.

Instruments are spread out and selections made of those which best represent the sounds heard. (rippling of water, rustling of leaves, whistling of wind, whispering of breeze, swish of water against rocks, bird calls, etc.)

Small groups work together on instruments to produce effect selected.

At a pre-arranged signal the groups come together and combine sounds.

When the result seems satisfactory, the production is taped - played back and evaluated by the students.

If improvements or changes are decided upon, it will necessitate re-taping and comparing with the original form.

Related Activities:

1) Listen to selections by great composers such as: Water Music by Handel; Listen in Aquarium from Carnival of the Animals by Saint Saens.
2) Discover and note compositions about nature; observe how effects are produced. e.g. THE BEE - Schubert; THE TROUT - Schubert; MORNING - Grieg; THE MERRY FARMER - Schumann; I DANCED WITH A MOSQUITO - Liadoy; PASTORAL SYMPHONY - Beethoven (first two movements - 1) arrival in country; 2) the brook)

Additional Activities: - combined or interspersed with the other subjects -

WALKING SONGS - while going to and coming from the scene of some activity in science, language, etc.

e.g. through pasture - HIKING SONG, by corn fields - TRAMPING, along river bank - MICHAEL ROW THE BOAT, & CANOE ROUND.

FARM SONGS - with barn and silo background - (record & film)

ECHO SONGS - by two groups located 1) river bank 2) river bed

OPEN AIR CONCERTS - Under trees or on tennis court - as a relaxation between, or at the end, of activities.

HEALTH & SAFETY

1. Learn how to identify edible and poisonous plants.
2. Gather some edible wild plants and understand their food values.
3. Identify poison ivy by the leaves, by the woody branches or vines and by the fruits.
4. Purify some water for drinking purposes.
5. Practice some first aid techniques for common accidents that may happen outdoors.
6. Practice proper safety measures and conduct to be utilized when hiking.

7. Follow correct sanitary measures in the care, preparation and clean up of food for a cookout meal.
8. Follow correct procedures for choosing a cookout site and care of a fire.
9. Wear clothing appropriate for the outdoor activities and weather.
10. Preserve foods by methods such as drying or salting.

LIVING ENGLISH

"The Wind in The Willows" - a creative drama lesson (grades 3-6)

The students may observe and then perform or express what they have seen. That is, a tree is hard on the outside, strongly rooted, straight, etc.; a flower has a strong flexible stem, is pretty, waves in the breeze, has a sweet scent, etc. These characteristics can be missed. In this way, animals, birds, water, fields, plants, clouds ------ everything can be expressed in a non-verbal manner. This increases the students perception and allows expression which transcends language.

Objectives:

To present through child drama a release for children physically, emotionally, verbally and mentally To stimulate the imagination and provide the opportunity for creation of character, plot and story line.
The particular unit described here should be developed with three goals

1. To give an opportunity to hear an outstanding story told in its setting.
2. To let the children develop from the story line using the natural setting.
3. To encourage the further reading from the story.

This whole exercise must be one of pure enjoyment. All children enjoy hearing a good story told to them. Hearing it in the natural setting is an added feature that should be developed. All children take delight in playing out and this whole unit should be highly motivated.

Curriculum

Content - introducing the novel "The Wind in the Willows" by Kenneth Grahame; through a story-telling experience in the outdoors followed by a creative dramatic experience. The values are obvious: the follow-up is widespread.

Modes of Instruction

The story is presented by the teacher by the river in a quiet, relaxed manner. As this whole unit can be done rather quickly it is suggested that this be a part of the day perhaps after the children have eaten or have been in a very strenuous activity. The first chapter "The River Bank" and the later one "The Piper at the Gates of Dawn" lend themselves beautifully to the setting.
After the presentation of the story the teacher should very carefully discuss the different characteristics of the characters -

Mole
Rat
Toad
Badger
Otter

The fact that these animals live in areas such as at the site should bring about a great deal of discussion on their habitat, their trails and their way of life.
The class should be divided into small groups and given the opportunity in these groups to develop a plot concerning the characters. They should be reminded to use the natural setting as much possible. This planning should take about 15 minutes after which time each group presents its "production" to the whole group.

Learning Products

The listening and planning skills come into play here. Working together as a team and the evaluation of the work is also evident. It would be hoped that this exercise would direct the children into further reading of the novel and certainly into playing out of any story. I suppose that the uniqueness of this experience is the setting and the atmosphere of hearing a beautiful story in a way that the child has not experienced before.

Some further outdoor "dramatic" activities:

1. Development of "Indian" theme with costuming and playing out.
2. Using "Natural Props" to develop mimes and stories.
3. Pioneer life and animal life acted out in the natural setting.
4. Development of mimes from all sensory aspects of outdoor education.
5. Developing original story lines from the outdoor setting.

ORAL FRENCH

Aim of Lesson

1. general - to extend classroom situation into a natural environment
2. basic - to present new vocabulary in its pertinent context

Method

Oral/written presentation and oral student response, with oral-written conclusion. Link-up with Art Lesson - (With other subjects e.g. natural science when possible)

Visual-Aids, Equipment

- flash-cards (names of animals)
- animals on the farm
- paper, pencils, crayons, clip-boards
- mimeographed sheets of animals studies i.e. names printed, with spaces underneath for drawing

Lesson Plan

Introduction (10 Min.)

a) Warm-up using related vocabulary, structures i.e. weather, day, month, season, etc.

b) Description of general situation (la ferme) leading up to presentation of animals in sections such as "les champs". "la revière", "Les arbres".

Main Body (30 min.) - Tour of Farm

a) Presentation of new vocabulary
Animaux: la vache, un tropeau de vaches, le mouton, le cheval, le cochon, le boeuf
Volaille: le poulet, la poule, le canard, la canne

b) Drills

c) Question/answer: qu'est-ce que c'est?
est-ce que c'est?
oui, c'est
non, ce n'est pas

Conclusion (20 min.)

a) Distribution of materials

b) Drawing of animals by children, from oral/written instructions.
Oral/written instructions to cover singular/plural and gender cases covered in main body lesson.

c) Continuity taken over by art teacher through selection by students of two of the animals drawn, for enlargement and colouring or .....?

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